

Australian Model Engineering

May-June 1998

Issue 78

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☒ The Bundaberg Fowler Locomotives
☒ A V-Twin Oscillating Engine



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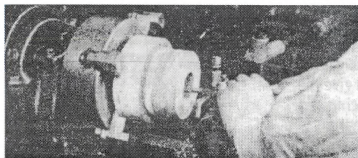
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Issue 78

Contents

- 5 Comment
- 11 Articulated Safety Cars — riding comfort
- 15 A Screw Cutting Tip
- 16 Club Roundup
- 18 Coming Events
- 19 A V-Twin Oscillating Engine
- 20 Back Issue Listing
- 21 Beginner's Choice — new to the hobby?
- 22 A Great Eastern Tram — part 5 (conclusion)
- 26 Square That Drill Table
- 27 *Henry C Wells* — model photography
- 28 Transporting Locomotives
- 29 The Bundaberg Fowlers
- 33 A Day in the Park — a little train is saved
- 35 Steam Chest
- 38 Morse Taper Shanks
- 39 What Size Injector?
- 39 Hardening H.S.S. Tool Steel
- 40 5" Gauge Electric Outline Petrol Powered Loco
- 41 Yarrow Boilers, Cardiff and Nostalgia
- 42 Building an Astronomical Telescope — appendix
- 43 Product Reviews
- 45 Letterbox
- 49 Ball Valve Seats Revisited
- 50 New Subscription Form
- 51 News Desk
- 52 Classifieds

The Cover

The fishing drifter Henry C Wells and a crab fishing boat. Two models built to the same scale by Brian Lemon. For tips on how to take photographs of your models like these, turn to page 27

Photo: Brian Lemon

Videos on Australia's Heritage

Our quest is to lock in the history before all is lost to time. It is not just the items of history, but the story behind these items that sets our videos apart from others.

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Comment

Investing in the hobby?

Many potential recruits to our hobby take an instant liking to the operational side of model engineering, but are put off by the thought of constructing say a locomotive, large model ship or traction engine from scratch with the associated setting up of a workshop etc. Others do not have the time to commit to spending many hours in the workshop. Others still, may not feel confident in their skills to complete such a project.

There is an alternative. From time to time, excellent working examples do come onto the market and are advertised. This is a good avenue for the above people to enter into and enjoy a very active participation in the hobby. However, if the models are of a high standard, then this will almost certainly reflected in the selling price.

While some of the traditional model engineers may sneer at those who "buy their way into the hobby" it is a fact of life that most people who are lucky enough to have full time employment, just do not have the time to invest in a major construction project.

In my observations over the past ten years, anything which reflects a particular prototype whether it be a locomotive, marine or other prototype, if they have been looked after and well maintained, then they have substantially appreciated. In the case of several locomotives I have seen change hands, their value has nearly doubled! What motor car or boat does that, except if they are vintage and after very expensive restoration!

Unfortunately the lending institutions have a curious attitude to lending money for such a purpose. They will throw money at you to buy a car or speedboat (which will be next to worthless in ten years time), but are reluctant to lend for a working artefact which appreciates substantially in the term of all but the shortest loan period!

A fellow model engineer recently struck such a problem. However, he eventually convinced the loan manager that his money was indeed very safe. As an aside this offers another good reason to join a club or society. They are peppered with people who work in the finance industry, their knowledge of the value of these purchases can help to prise open the loans cabinet.

So next time you visit a club track or the lake on running day, I will almost certainly guarantee some of the people you see in charge of their steeds have made the investment!

Neil Graham

Join us in a great hobby!

If this is your first issue of *Australian Model Engineering*, welcome!

In successive issues we cover many topics centred on that wonderful process of model engineering — alias *tinkering*.

If you're new to model engineering as well as our magazine, you'll benefit from getting together with other model engineers — we're good at sharing ideas and saving each other money! If you don't have any contacts, start by looking in Club Roundup to find a club that's near to you. Many of our readers have discovered people with similar interests literally just around the corner.

Helping other model engineers is the simple idea of the volunteers behind this magazine. Our readers write items for us — for the same (non-existent) rate of pay! If you have ideas, opinions or techniques that you feel would be interesting to others (especially from the newcomer's angle), please drop us a line. We can send you a useful guide and help with preparing artwork or editing.

I hope you'll enjoy the great fellowship that makes our hobby special, and that you'll support our advertisers — after all, they help pay our bills!

David Proctor

Managing Editor



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A look at reopened narrow gauge ex South African line in the east of the country and various Garratts hauling heavy coal trains on private colliery lines. This video contains brilliant scenery being traversed by "soon to be history" commercial steam workings, all filmed in the spectacular winter months. Running time - 55 minutes.

Steam Fever \$44.95

Another South African video which looks at various aspects of mainline operations in the final days of steam, including "Red Devil" and a look at the Class 25 condensing locomotive - described as the "last ship of the desert." Many dramatic steam scenes are included along with the day-to-day activities of the crews which worked what must be described as one of the most modern steam systems running on 3'6" gauge in the world.

Superlatives in Steam \$44.95

Shows some of the worlds largest steam locomotives in preserved working order on U.S. railways. Video includes shots of Nickel Plate Berkshire 2-8-4 no.765, Norfolk and Western 'J' Class 4-8-4 no.611 and Norfolk and Western 'A' class Mallet no.1218, said to be the

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Milestones in Railway Preservation Australia

This video was written and directed by Graeme Belbin. The programme looks at a variety of subjects, from Qld's 130 year old A10 No.6, to a Victorian R class leading 3 diesels on a 3200 ton night goods from Bendigo to Melbourne. Footage includes 3830 as well as rare archival scenes such as tripple headers out of Lithgow in the 1950s and black 3801's supposed last run. Duration: 90min. \$54.50



Rail Scene NSW Vol.12

This book is an all black and white album of NSW steam classes 19s to 60s shown in exceptional detail in everyday working life. Photos are A4 size landscape and printed one per page. An excellent reference material for the enthusiast NSW loco builder. Soft cover \$39.95



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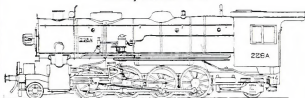
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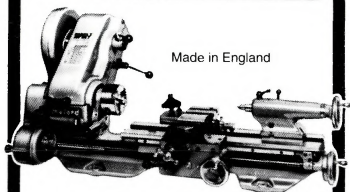
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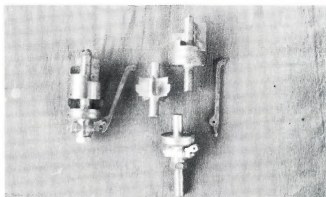
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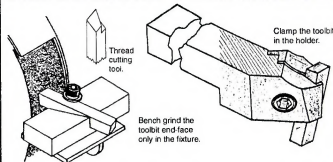
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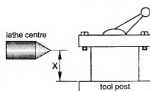
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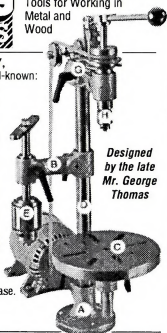
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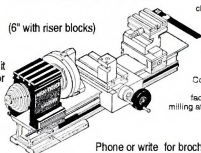
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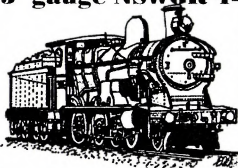
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The locomotive, with its two 1 3/4" bore cylinders, 51/8" diameter driving wheels and 200lb weight, all add up to a good passenger hauler for club or private tracks.

For further details, please write, fax or phone

PO Box 126, Wallsend, NSW, 2287

Phone/Fax (02) 4951 2002

Classic Marine Models

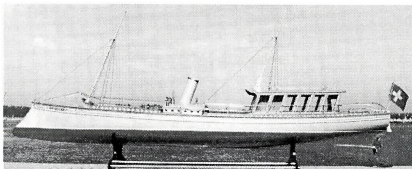
DER SEEKADETT

This fine model, based on a 1912 catalogue of Escher Wyss of Zurich, is fitted with a twin cylinder slide valve reversing engine 9mm bore x 9mm stroke. It has a large capacity boiler fitted with safety devices. Steaming time is around forty minutes at sustained high speed.

The hull is fibreglass, the cabin and open areas are panelled in alternate pear and lime, stained to represent the mahogany and pine of the prototype. The saloon has a galley and w.c., upholstered seats, carpeted floor, and a drop leaf table.

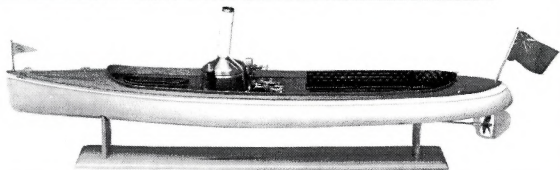
Over 120 brass fittings and castings (no whitmetal) of details such as boathooks, doorplates and handles, treadplates, taps etc.

At one twelfth scale, there is plenty of scope for the miniaturist to add their own detail.



Scale: 1/12; Length: 1340mm; Beam: 203mm
Maximum draft: 100mm; Displacement: 9.08Kg.

OPAL



A magnificent 1067mm long, scale model open steam launch based on the original drawings of the 1907 fast steam launch. Opal is 1/10th scale, and the kit includes:

- The Marten, Howes & Bayliss, twin cylinder, slide valve, reversible steam engine.
- Scale vertical boiler, pipework and pressure gauge.
- Hand-laid fibreglass hull.
- Laser cut bulkheads and full mahogany decking, seats and floors.
- Stainless steel propeller shaft, brass propeller and skeg.

Also available are single and three cylinder steam plants and scale hulls of famous steam yachts including "SY Ena" and "PV Captain Cook".

a twelfth scale model of a typical Edwardian steam powered river launch

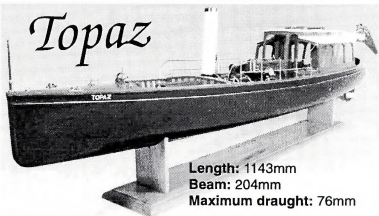
This elegant and powerful model launch has a fibreglass hull, the decks and cabin are mahogany, the vertical side panelling is in alternate mahogany and lime.

The saloon has a galley and separate WC. The seats in the saloon are upholstered, the floor carpeted and it has a drop-leaf table. The forward doors lead via a covered steering position to the open engine and boiler space. The engine has a skylight over. There is a walkway each side of the engine and boiler which leads to the forward cockpit. This is divided from the machinery space by a panelled thwartships bulkhead.

There are two steering positions, one in the forward cockpit and one in the covered entrance to the saloon. The forward cockpit has slatted wooden seats and a drop-leaf table.

The model has over a hundred brass fittings, (no white metal is used). These include such details as boathooks, doorplates, treadplates, table fiddles, taps etc. There is also a copper Windermere kettle.

The saloon has a detachable coach roof allowing access to the galley WC and seating area. At one twelfth scale there is plenty of scope for the miniaturist to add their own personal touches.



Length: 1143mm
Beam: 204mm
Maximum draught: 76mm

Duration: 30 minutes at full speed. **Displacement:** 4.5 kg. **Boiler:** Horizontal return tube, gas fired with refillable gas, oil separator.

Engine: Twin cylinder double acting 9.53mm x 9.53mm slide valve, reversing.

Classic Marine Models International Pty. Ltd.

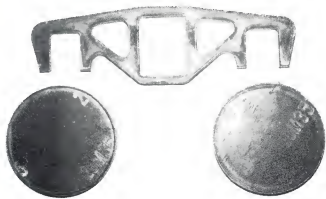
19 Porter Street, Bondi Junction, NSW, 2022

Phone/Fax: (02) 9389 5086

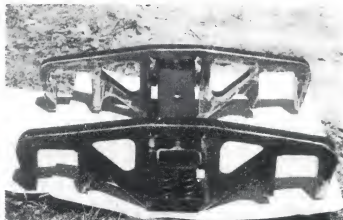
Articulated Safety Cars

Better safety and better riding for passengers —
based on analysis of full-size practice

Story and photos by John Nicolson and Ian Smith



Bogie sideframe and two wheel blanks as cut from 25mm plate



An assembled three-piece bogie — two sideframes and one bolster. Springs have also been fitted

In February, Canberra SMEE unveiled a new type of passenger car for use on the Kingston Miniature Railway. The first pair of cars was immediately popular with the children but the response from the mums and dads was even greater. They are based on US and Australian five-pack articulated container cars/wagons designed for double stacking.

There are three outstanding features of the new cars. They are:

1. **Stable:** they have a very low centre of gravity — an adult standing on one side can't tip them over.

2. **Comfortable:** the bogies outside of the ends of each seat have adequate springing and large diameter (145 mm) wheels.

3. **Wide:** the floor pans on either side of the longitudinal seat have 50 mm high sides and at 150 mm are wide enough to prevent foot dragging by children.

berra and Wagga Wagga. In 1993 Clive had just returned from the Castledare Convention via Alan Sunderland's Serpentine Railway. There he had been impressed by the articulated passenger cars in operation.

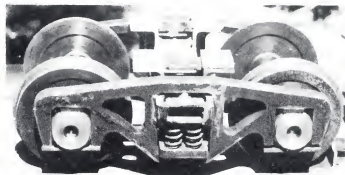
I too had been imbued with the benefits of articulated cars in full-sized practice. Although they were used by Sir Nigel Gresley on the LNER in the 1930s, they really came to the fore in the 1980s in France — on the world's fastest trains, the TGVs. At the same time, articulated well cars were introduced to US railroads and are now a regular feature of the world's largest container trains. The latter were copied shortly afterwards in Australia, and in 1990 I saw the first articulated well cars of Australian National at Forrestfield in WA. Now you can see "five-packs" (five-car

The concept

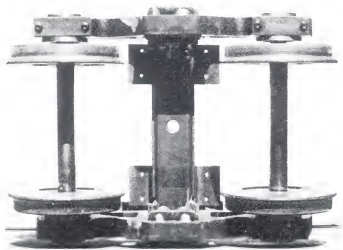
Ideas for these cars began in discussions with Clive Huggan on one of our frequent journeys between Can-



The intermediate bogies are fitted with removable side-bearers topped with plastic plates. These are attached to either side of the bogie bolster



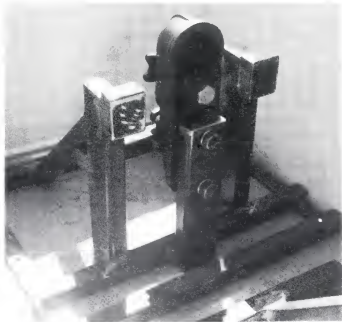
A completed intermediate bogie, with sidebearers in place



The same bogie, tipped to show the underside. This bogie rides on eight springs, four to a side.



Two completed bogies. The one on the left is an end bogie, and therefore has only one pair of bearer pads, mounted in this case on the bolster. The intermediate bogie on the right has, as already seen, four pads



The first of the bolt-on frames which forms the basis of the articulated joints. The conventional trailer drawbar looks fine in 7" gauge. Note the welded on steel "blocks" which ride on the bearer pads.

articulated sets) of double-stacked containers of the National Rail Corporation, north and west of Adelaide, where clearances are large enough to permit such high vehicles to operate.

Although on our miniature railways we are talking passengers, the cars that really interested us were the five-pack double-stacks. Why? On the full-size cars, the load-carrying well section only clears the rails by about 150 mm. Scaled at 1/6 (2" to the foot), this means 25 mm above rail level in 184 mm (7 1/4") gauge (or, dare I say it, 240 mm — accurate for 1/6 scale standard gauge). In fact, in developing the prototype, Ian Smith and I settled on 35 mm from the top of the rail to the bottom of the floor structure.

Development — car bodies

In Canberra we have been and are using some very simple ride-astride cars, made by folding up a sheet of 1.6 mm steel, 2 m long, with bulkheads welded to each end. They ride on very simple unsprung bogies running on small (75 mm) diameter wheels. The bearings were press fitted or secured with Loctite® on to the axles and into the wheels.



The old and the new! The bogie on the right is one of the old bogies which ran under the wagons before they were converted to articulation

While they have served the club well for more than ten years, the cars have left much to be desired. Without any springing or padded seats, their "pile driver" ride over the diamond crossing was a sensation to be experienced once only — yet we were subjecting passengers to this treatment twice every circuit!

The first improvement was to fit upholstered seats to our cars. This quietened the drumming and eased the pain of traversing the diamond. The problem of foot dragging also appeared early, and constant vigilance by track marshals in radio contact with drivers proved necessary to prevent this dangerous practice by younger and sometimes older patrons. Widening the footboards and the adding of the lip largely

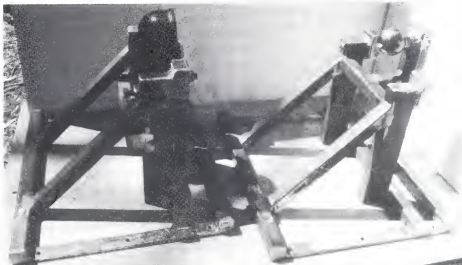
stopped this. All cars in the club are being widened to the new standard.

Ride comfort and bogie reliability were still major problems. Maximum track speed on the long straight has been set at 12 km per hour for 184 mm gauge riding cars (most of our engines are fitted with Cyclocomputer® speedometers). At this speed, the small diameter (75mm) wheels are rotating at 850 revs/min. With a fully laden car weighing up to 400 kg and no springs, the shock loads on such a wheel bearing and axle assembly are very high (the problem of high unsprung mass).

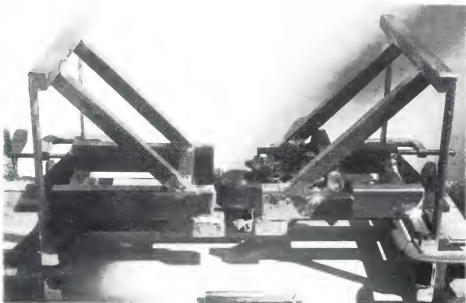
Development — bogies

The next logical step was to fit sprung bogies with larger diameter wheels. Based on American Railway Association standards set out in the 1927 *Locomotive Cyclopedia*, a 1/6 scale bogie was designed. Basically the frame and wheelbase dimensions are the same as those of the three-piece bogies used on freight wagons all over Australia today. The three pieces are the two side frames and the bolster.

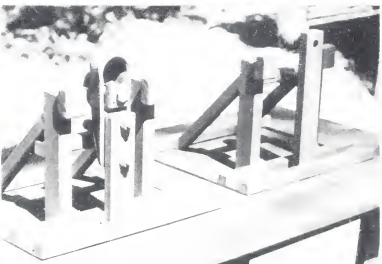
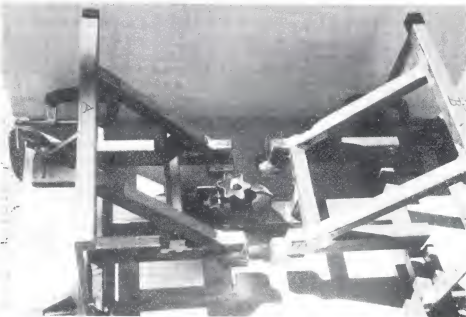
The articulated concept used on the full-sized five-packs allows the bogies to be placed outside the bulkheads at each end. This permits the use of large-diameter wheels without raising the centre of gravity of the car. In fact we have been able to lower the C of G



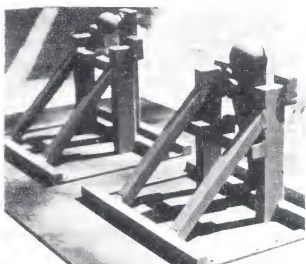
A pair of bolt-on frames. The all-welded construction method is quite clear in this photo. The actual sizes of materials are a matter for the individual — the CSME preferences appear in the text.



(above and below) Two completed units are clamped temporarily into position and coupled together to check alignment. The vertical frames at the back of each unit are designed to bolt directly onto the ends of the carriages



This pair of bolt-on frames have been completed and primed ready for painting and installation.



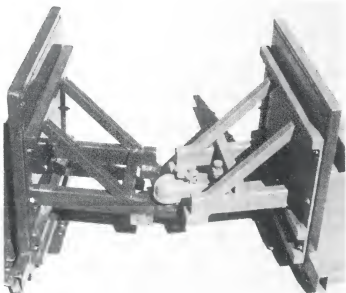
The same pair of frames viewed from the top. The sturdy nature of the design is apparent

of the retrofitted cars by almost 50 mm, even with much bigger diameter wheels. Studies of Athearn® HO scale models of Gunderson® "Maxi-Cars" provided clues as to how this might be achieved. It was decided to make the bogies as heavy as possible, and to 1/6 scale, which is equivalent to a 3'6" gauge model in 7/4" gauge. CAD drawings were prepared by David Dunnet from the 1927 *US Locomotive Cyclopedia*. Hawleys cut the sideframes from 25 mm steel plate. Axleboxes were machined from round bar with four flats milled on each to fit the pedestal gaps in the sideframes. Wheel blanks were also cut by Hawleys from 25 mm plate and machined to AALS narrow gauge standards. Axles were machined from 25 mm BMS round bar. Wheels were heat-shrunk on. It was decided that each articulated bolster should be able to carry 400 kg on eight springs. The dimensions of the springs and the loaded and free lengths were given to S&S Springs in Melbourne, who designed and produced a spring for our purpose. A batch was ordered and they proved to be perfect for the job.

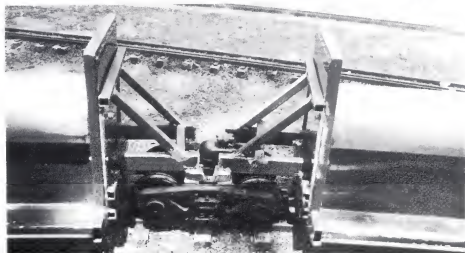
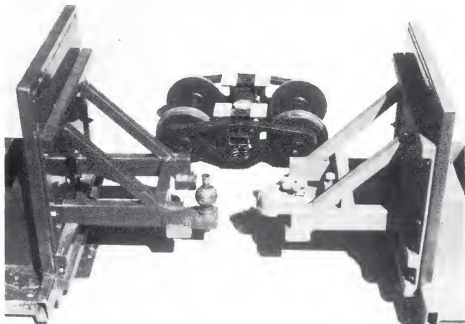
Articulated joints

Since we wanted to retrofit existing cars, we designed bolt-on frames. The frames were fitted to each bulkhead. Three types were needed. The A end and B end frames (for the terminal units) are the same: they carry a standard coupler pocket. But the intermediate frames for the articulated joints differ from each other and from the terminal units. The leading intermediate frame of each joint pair (bolted to the rear of the car ahead of the joint) carries a drawbar fitted with a standard 50 mm diameter towbar ball. The king pin for the intermediate bogie passes through the vertical centre line of the ball. The trailing unit (bolted to the front of the car trailing the joint) carries a standard low-profile 50 mm trailer hitch coupling with a star-wheel hand nut and simple spring ratchet to lock the nut.

The frames are made from 25 x 6 mm mild steel flats and 25 x 25 x 3 mm blue primed RHS tube. The draw-bars and side bearer



(above and below) Two wagons coupled together. In the lower view the bogie can be seen ready to be fitted. It simply slips onto the bottom of the pin which extends down through the tow-ball.



The wagons finally coupled up on the track, bogie in place



First tryout on the track with the bolt-on ends clamped to the two wagons, and judging by the expressions on the faces of these three, it is a success. They are (from left rear) Chas Clifford, Ian Smith and John Nicolson.

pads are made from 50 x 25 x 3 mm RHS tube. Holes in the ends of the tubes are plugged with 3 mm steel welded in. This prevents children sticking their fingers into the tube ends. The frames are MIG welded together and bolted to the car bulkheads with six 1/4" UNC x 2 1/2" high tensile bolts.

Each intermediate bogie carries a removable side bearer assembly that carries four pads fitted with yellow plastic plates supplied by Unasco. (More details will be provided in a later article; it is from the same material used for bolster plates on full-sized railway vehicles). These plates carry the side bearer pads on the inter-car end frames. The use of flat bearer plates on bogie and car bolsters is more closely related to full-sized practice than the "ballrace on a stick" approach frequently adopted by model engineers when it comes to "passenger trucks".

The first pair of terminal cars linked by a centre articulated joint were trialled in January and put into service at our regular run on 22 February. A third and fully intermediate member of the trio was tested in service for a charter group on 5 March. The three-car set or "three-pack" runs perfectly, loaded or unloaded.

We are now in the process of fitting brakes to the bogies. The units roll so freely compared with the original cars that we now have to find a way of stopping them! In the USA, each unit of a five-pack is called a "platform". We regard each "platform" as a single car, so we require a guard and a brake on three-packs or larger units.

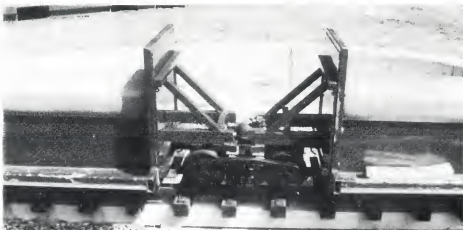
Initially we will fit the B-end of the first three-pack with a hand-operated guard's brake. However, Ian and I are now working on a miniature version of the Westinghouse automatic airbrake, and we shall report on the results of our experiments later. We are firmly convinced that what works in 1435 mm (4'8 1/2") and also in HO gauge must work in

all gauges in between — particularly 7¼" and 5". So far this belief has worked well for us.

So successful have been the prototype Articulated Safety Cars that the club committee has decided to convert all existing cars when time and funds permit. As well, our research group is now looking at purpose-designed bodies for articulated sets to supplement the retrofits.

There is some truth in the rumour that our aim is to build, not just a five-pack, but a six-pack — painted green in an attempt to attract an appropriate sponsorship!

(AME will be following the ongoing evolution of the articulated cars in this article. A braking system is currently being designed and it and other planned enhancements will be brought to you in future issues. I have had the pleasure of riding on and towing these wagons and I would rate them as the smoothest, quietest and most stable I have experienced. It would be interesting to see the design adapted for 5" gauge ... Ed.)

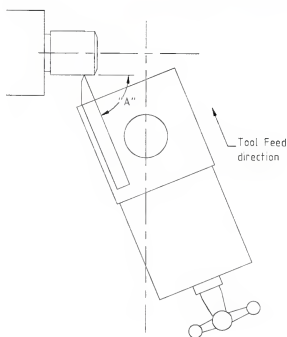


Completed and sitting on the club turntable waiting another turn of duty and (below), a three-pack heads off to work.



A Screw Cutting Tip

by John Podmore



Shaded area shows metal removal using Compound Slide to feed tool into workpiece



Shaded area shows metal removal using Cross slide to feed tool into workpiece

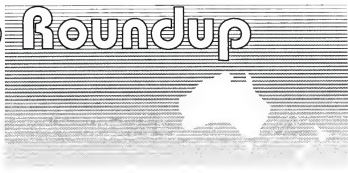
Dim "A" is set at half the thread angle

To use this way of cutting threads the tool is brought up to the work piece dia and then both cross slide and compound slides are set to zero. The cut is then applied by advancing the compound slide only and returning the cross slide to the zero mark with each pass of the tool.

Because metal is removed from one side of thread only, less pressure is placed on the cutting tool and the swarf has a clearer passage away from the cutting edge. On the larger threads I often take up to .5mm cuts to begin with, reducing them as the depth of thread gets greater.

I find that even when cutting threads in stainless steel there is no ripping or pick-up caused by the swarf building up.

Club Roundup



compiled by Neil Graham

Moorabbin Vic

By the time you read this the new char bunker should be well under way. Just received is the 3 1/2"-5" weighbridge and its control box. This will be installed in the track near the steaming bay. This particular piece of equipment will allow the determination of all-up weight of rolling stock and the individual axle loadings.

Construction on the new pedestrian bridge is practically complete. The deck has been painted with a rubber type coating and this considerably deadens the thumping of many feet as well as providing additional safety.

The December running day got off to an early start for the benefit of the Multiple Birth Association with 80 people attending. The January gatherings night saw a good collection of equipment ranging from double acting oscillator to a gas turbine for a R/C aeroplane.

The Steam Locomotive Society of Victoria

Location : Rowans Road, Moorabbin

Public Running : 1st Sunday except January

Moss Vale NSW

The club has commenced earthworks for the laying of their "portable" oval track with a station loop and access siding. On what was originally thought was a gentle slope, it transpired that (after the dummy level did its work) one side of the oval needed to have a one metre high embankment and a half metre deep cutting at one end. Even then, the ruling grade will be 1 in 70! Roadbed preparation continues steadily.

Southern Highlands Model Engineers Inc.

Location : Contact: (02) 4868 2404

Public Running : to be notified

Eddington Vic

This club, previously known as the Victorian Miniature Steam Locomotive Society has changed its name (see below). They have an oval track of around 600 feet and cater for the three smaller gauges. There are plans to extend the track.

Loddon Miniature Steam Locomotive Society Inc.

Location : Mc Coll Street, Eddington

Public Running : 4th Sunday, March through November.

Eltham Vic

The 1997 Christmas Party was well attended and enjoyed by all. The railway's 74th point was constructed and installed between departure end Meadmore platform and Nillimbik tunnel. Two new roads have been installed between the turntable and the workshops. Construction of new track panels for various sections of mainline are completed. They now await a suitable day for installation. A further quantity of 14 lb rail has been obtained.

Saturday 14th February was a real fun day with the invited attendance of the members of the Bellarine Peninsula Railway, who enjoyed some bi-directional running. Over an hour of this was had without any mishaps.

Diamond Valley Railway Inc.

Location : Lower Eltham Park, Main Road, Eltham

Public Running : Every Sunday & public holiday except Christmas

Mangere NZ

The last few months have been travelling time for many members. They attended the New Plymouth Labour Weekend as did many who also attended the Havelock North weekend. The highlight for many was the Expo at Tauranga (which one wag described in their Newsletter as a "Weekend on the Hiss") to which many took their trusty steeds and made a long weekend of it.

Manukau Live Steamers Inc

Location : Mangere Central Park, Robertson Road, Mangere

Public Running : Every Sunday

Bulla Vic

It is hoped to have a complete section ballasted of 5"-7 1/4" track to run on by mid year. As said in the last issue, public running using the portable track commenced. However, difficulties with the track have caused a re-evaluation and the Committee has decided to discontinue this operation and wait until the permanent track is complete to a running stage before re-commencing operations.

On the construction front, over 50 lengths of rail have been turned out from the AIF's Factory. Will allow tracklaying to continue.

Tullamarine Live Steam Society

Location : 15 Green Street, Bulla

Public Running : to be notified

Auckland NZ

Auckland Soc. of Model Engineers

The club is now selling new name badges with a micrometer logo to its members. The club still has T-shirts and sweaters in stock. The Tuesday club continues with improving the club's grounds aesthetics. The railings are progressing and the fire escape door is being strengthened. It is intended to put in some sensor lights at the club rear to deter more break-ins.

The club has decided that coal fired locomotives that run on the ASME track must have a device fitted that minimises the emission of sparks that could cause injury to the general public in place by Easter 1999.

Scale Marine Modellers

The 23rd November saw the Annual sailing competition with 14 competitors. Attendance at November, December and January free-sail days were poorly attended. However, January public day the members turned up and a good day was had with the boats. February public sailing day was deemed a success with the public boats well and truly caring their keep.

15th February was the Champagne Course day. Ten members competed and enjoyed the course the committee laid. Ian Donal, Dave Bowyer and Nobby Clarke took 1st, 2nd and 3rd respectively.

The warship regatta at Wanganui was a splendid event. The fleet was guesstimated at some 30 warships. These included two battle-ships, two aircraft carriers and a flotilla of cruisers and destroyers. A paddle-steamer was in attendance, carrying passengers who reviewed the fleet.

Hamilton sail day provided enjoyment for the 20 members (25 boats) who travelled down from Auckland.

ASME and SMM (shared location)

Location : Panmure Road, Panmure

Public Running : Every Sunday

Toowoomba Qld

The Toowoomba track is operational again. Running day is the third Sunday from 12.30 pm. Private running by arrangement Bob Long (07) 4360 0146. The Official opening date is yet to be set — watch this space!

Toowoomba Live Steamers

Location : Kearney Springs Historical Park, Spring St, Toowoomba

Public Running : 3rd Sunday from 12.30

Narara NSW

At the Autistic Run in December, three locos ran the roster, the kids had such a terrific day that the organisers have indicated their intention to book again next year.

Work on the 300 feet trestle bridge is nearing completion. That will give access down to the bottom 6 acres of land, allowing the track to be expanded into that area. When completed, the run through the swamp promises to be a very scenic one. Points have been com-

pleted for the 7¼" diversion and the 5" track has been continued further into the swamp.

December run day had seven locomotives and they were kept busy. The Narara Scouts run day had four locos which performed faultlessly all day. January run day was a hot one and four locos did the honours. The heat caused a few injection problems.

Central Coast Steam Model Co-op Ltd

Location: Lot 10 Showground Road, Narara
Public Running: 1st Saturday

Paraparaumu NZ

Runs on 28th December and 4th January were satisfactory with not a diesel in sight! The highlight of February was the Open Weekend and after a dress rehearsal on Friday 6th, the weekend was a great success with thirteen visiting locos, some from as far as Auckland. Estimated over 3000 passengers were carried over the weekend. On the 13th February there was a special run for the Parawai Lions Club.

Kapiti Miniature Railway & Associates

Location: Marine Gardens, Raumati Beach
Public Running: Every Saturday & Sunday

Petone NZ

Footbridge repairs have been carried out and completed. January run was held but it was so dry and with risk of lineside fire it was thought prudent to remove the steamers from the track.

The track running roster is still operating (with a few hiccups) but by and large the running at the beach track has been satisfactory. The old *Steam Train Rides* sign was thought not to reflect the trains which are frequently diesel hauled. The signage has been modified to *Train Rides* and is now in use.

Hutt Valley Model Engineering Society Inc.

Location: Marine Parade
Public Running: Every Sunday

Maidstone NZ

The petrol loco has been overhauled and is back in service. The November open day started well but the day became more miserable as it went on. Assistance was provided by the Wellington Vintage Machinery Club who put out a very successful display. The 7¼" locos were operated on the short out and back through the station. Seven Maidstone members attended the Tauranga Expo and from all accounts were glad they made the trip. The next project for the club will be the re-routing of the elevated track around the base of the hill to make way for the ground level track.

Maidstone Model Engineering Society Inc.

Location: Maidstone Park, Upper Hutt
Public Running: Unknown

West Ryde NSW

The November run day for the Malcolm Sargent Fund was a success with over 2100 rides being taken. The December run day

with members of the Australian Railway Historical Society (ARHS) was nearly a non steam event with a fire ban in force. The Track Superintendent had to ring around for diesel power. However, at the eleventh hour the fire ban was lifted and normal steam operations were on for the day. As was the case in last years, ARHS members operated the Signal Box and accounts had a terrific time.

The elevated railway has had anti-tip rails fitted in the station area and are working well. The garden roster has been revised and the groups rationalised to make each more effective. The elevated track ground frame has had some "hot" adjustments and now the cross-over can be operated from the frame. Work has been progressing on two inner main sidings. Painting of the rolling stock has continued and new NSWRL style numbers have been kindly supplied by one of the members.

Planning work has started in preparation for the council to run a large storm drain through the site. Sections of the elevated and inner and outer main will be lifted (as well as a complete bridge) to allow contractors equipment to do the job.

Sydney Live Steam Locomotive Society

Location: Anthony Road, West Ryde
Public Running: 3rd Saturday (afternoon)

Wilson WA

Recently we saw a new locomotive at the club in the form of WAGR W class from the works shops of Rod Pitt. It looks good and runs extremely well. Another loco in the building is a U.P. Challenger, which is now at the rolling chassis stage and the quality of workmanship is a credit to builder Chris Hollands (featured in AME Nov-Dec 1997 ... Ed) A proposal is being mooted for the signalling of Niana, Hume Junction, Aberup and Ferntree from a centrally located signal box.

By now most people are aware that the AALS Convention set down for this site last month had to be transferred to Bunbury at short notice. (Convention report will appear in the July-Aug 98 issue ... Ed). The railway remains closed until further notice, but with the plans already under way, when Castledare does re-open it will be even better than before!

Castledare Miniature Railways of WA Inc.

Location: rear of 100 Fern Road, Wilson
Public Running: 1st Sunday (closed until further notice)

Gore NZ

Plans continue for the 10th Anniversary celebrations on Labour Day Weekend of 24-26th October next. February was a quiet month for train runs with one run for the elevated and one run on the portable being the crank-up at Edendale.

March marks the end of season for the portable track, with concentration of efforts on the raised track. The club trolleys (which number four) will now be allocated one each

to non trolley owners. It is felt they will get more use and be maintained regularly.

Gore Model Engineering Club Inc.

Location: Hamilton Park, Gore
Public Running: 3rd Saturday

Berkeley USA

The New years day Chili Run was a success with over 50 people in attendance.

On the running front, the Pacific and the Atlantic are OK., one gondola is down but the rest of the rolling stock is fine.

Golden Gate Live Steamers Inc.

Location: in Tilden Park, Loma Cantadas & Grizzly Peak Blvd., Berkeley CA.
Public Running: Every Sunday

Gisborne Vic

The portable track has been running for some time and is now a regular earner. Runs included at the Gisborne market and the Riddells Creek Primary School.

The 7.25" track is in need of maintenance and also more 2 foot track is to be laid. The Ruston Hornby portable is now to the stage of having a full set of tubes back in it. The Gisborne club will be part of the Vintage Tractor Pull to be held on Sunday 17th May

The Gisborne Vintage Machinery Society Inc.

Location: Webb Cres., New Gisborne
Public Running: 1st Sunday

Napier NZ

Official track opening was scheduled on 21st and 22nd February

Hawkes Bay Model Engineering Society

Location: Anderson Park Napier
Public Running: Unknown

Canberra ACT

The last running day saw the unveiling of the new articulated passenger carrying cars (see article this issue ... Ed). Reports back passengers and club members have nothing but praise for the design. They are excellent to ride on and are most stable wagons. The club committee was so impressed that they have decided an upgrading for all passenger stock is to commence and the wagons be converted as funds permit.

Canberra Society of Model & Experimental Engineers

Location: Geijera Place, Kingston
Public Running: Last Sunday

New Plymouth NZ

The Labour Weekend in October 1997 was a resounding success. First visitors arrived at 8.30am. There were more than ten visiting locos. It wasn't long before all trolleys were in service. One loco of note was Alex Holmes' 0-6-0 diesel. Several years ago it was vandalised almost beyond repair but it has been faithfully re-built with a new permanent magnet motor and a commercial electronic controller. The loco ran almost constantly and reliably all weekend. The Concourse d'Elegance was won by Ross Bates and

Heather Robinson from Napier with their battery powered Australian National liveried diesel based on the former SAR 930 class locomotives. (Information from Manukau LS newsletter ... Ed).

New Plymouth Society of Model Engineers

Location : Cnr Liardet and Gilbert Sts, New Plymouth

Public Running: Every Sunday

Echuca Vic

The members of the Campaspe Valley Railway have been busy during the hot summer months constructing the new extensions

to their picturesque riverside track. The track is located alongside the Campaspe River which joins the Murray at Echuca.

The new work being completed involves a mainline extension along the banks of the river and a new station yard. By the time of the Victorian Quarterly Invitation run in May (see *Coming Events*) there will be approx. 550 metres of continuous 5" and 7¼" dual-gauge mainline track in operation. It was decided to utilise 'moving-frog' points in deference to the problems occasionally experienced by some 5" locos on dual-gauge track. All pointwork has been removed and replaced and the whole layout has been regraded to a

ruling gradient of 1 in 180. Trackwork is welded steel sleepers on the original track and grooved timber sleepers on the new extensions. The members of the Cobden Club generously made their sleeper grooving machine available for CVR members' use.

The club has a small membership of just thirteen very active and committed people, and its main activity is the well known Steam, Horse and Vintage rally staged by the Rotary Club of Echuca every June long weekend.

Campaspe Valley Railway

Location : Echuca

Public Running: Queens Birthday weekend

Coming Events

1 to 3 May

South African National Steam Meet

Hosted by Durban Society of Model Engineers, Virginia, RSA. (Note date change)

2 to 3 May

Lake Goldsmith Rally

Rally site located via Beaufort, Vic.

2 to 4 May

Annual Invitation Run - Mackay Qld

The Mackay Society of Model Engineers are again hosting their annual Labour Weekend run. All welcome. Contact Len Heaton (Sec.) (07) 4959 2169.

9 to 10 May

NSW Interclub Run - Orange NSW

5"g. track only (470m.), 240 volt, comp. air, char and petrol available. Some loco storage, some camping (limited). Contact Bob MacKinney (Sec.) (02) 6362 0456.

9 to 10 May

Victorian Quarterly Invitation Run — Echuca

The members of the Campaspe Valley Railway, on the banks of the Campaspe River in Rotary Park, Echuca will host this run on their newly extended 5" and 7¼" dual gauge track (new trackage and moving-frog points). Contact club Secretary, Ross Walker on (03) 5480 2911 in business hours.

16 to 17 May

3½" Gauge Kindred Society Run — SLSV Moorabbin

Come and run your 3½" locos and meet our kindred brethren. Coffee/tea/BBQ/conversation supplied. (Other locos accepted). Don't forget your boiler tickets. Enquiries to Ken Rofe (03) 9580 1408

6 June

D-Day, HME at Galston NSW

A D for Diesel day will be held at the Galston Valley Railway, 29 Mid Dural Rd, Galston. Petrol or electric traction also invited. NO STEAM locos please 3½" and 5"g. only. Call (02) 9484 7583 s

6 to 7 June

Annual Steam, Horse and Vintage Rally — Echuca

Visit the 'steam capital' of Victoria where Campaspe Valley Railway will be running in co-operation with the Echuca Rotary Club's well known rally. Run on the 5" and 7¼" railway, take in the extensive exhibits of the Steam Rally and the mighty paddle steamers on the Murray. Over 30 motels, hotels and caravan parks in Echuca - Moama. Contact Ross Walker on (03) 5480 2911 in business hours.

6 to 8 June

Hot Pot Run - Illawarra Live Steamers

1 August

Grandchester Old - Grand Opening

New 5'7"-1¼" track opening in conjunction with Qld. Railway Heritage Weekend (birthplace of QR 133 Years). 2 Ipswich Rd, Grandchester. Mark (07)5465 5768

8 - 9 August

Blowfly Rally

Hosted this year by the Illawarra Live steamers

3 to 6 September

Major Centenary Exhibition

Hosted by the SMEE, (UK) 1898-1998, and located at Brunel University, Uxbridge, West London. Information from SMEE 100, Resources Exhibitions Ltd, 2 Forge House, Summersleys Road, Princes Risborough, Bucks, HP27 9DT, UK. Phone 01844 34 2894. Fax 01844 34 4988. e-mail: CRE@resourcex.co.uk

5 to 6 September

Central Coast Steam Model Co-op — Birthday Run

Come and enjoy a peaceful Fathers Day on the coast. Saturday is normal running day, visitors not required to carry passengers unless they wish to. BBQ and night running. Sunday running depends on the number of visitors who notify beforehand. Contact N.Richards (02) 4344 4385 for further and up to date information.

26 to 27 September

Canberra Annual Floriade Invitation Run

Steam and Tulips at CSME's Kingston Miniature Railway 2½" and 3½" elevated. 5" and 7¼" ground level. Contact James Mitchell, PO Box 4462, Kingston. ACT 2604. Phone James Mitchell (02) 6286 5936 or John Nicolson (02) 6247 7182

3 to 4 October

Annual Inter-club run — Port Augusta SA

Port Augusta Model Engineers will again be hosting this event at the club track, Homestead Park, Elsie Street. 5" gauge track only, but everyone welcome to join in. Nomination forms from the Secretary at 61 Edinburgh Tce., Port Augusta SA 5700 Ph. (08) 8642 3984

10 to 11 October

Invitation Weekend — Berry NSW

2km. Of 7¼" railway and traction engine track. Camping, kitchen, BBQ, shower, loco storage. Located at B35, Princes Highway, Berry. Enquiries to Les (02) 4464 1304

17 to 18 October

National Traction Engine Rally

This year to be held in Canberra at the CSME's grounds, Gellera Place, Kingston (next to the ARHS Railway Museum). Further details to be advised.

24 to 26 October

10th Anniversary Celebration - Gore NZ

NZ Labour weekend, 10th Anniversary Celebrations and an open weekend at the Gore Model Engineering Club, Hamilton Park, Gore. Contact Secretary Timothy Shanks (03) 208 4382, for details.

31 October to 1 November

Wagga Wagga Invitation Days

5" and 7" track in scenic surrounds. Model traction engines, stationary models, boats, full-size historic engines, many tourist attractions and a great welcome. Contact: David Font (02) 6921 4762

Mackay Qld

The Paget signal box is coming along well and should be finished and in use by the Labour Day Invitation Run (see *Coming Events*). Mackay City Council have also been busy and installed gas BBQs, shelter sheds, playground equipment, drinking fountain, floodlights and new flower beds, together with new seats spread around the park.

Mackay Society of Model Engineers Inc.

Location: Muller Park, Planlands

Public Running: 1st Sunday

Rotorua NZ

The good news is that Rotorua club still lives! According to their Feb-March newsletter, twelve people have come forward and the future looks better.

Rotorua Society of Model Engineers

Location: Te Amorangi Museum, Robertson Avenue, Holdens Bay

Public Running: 2nd Sunday

Maryborough Qld

The AGM dinner meeting was held in February at the relocated "Old Yengarie" sugar mill building. Graham Chadbone was elected President and Bob Kimber remains as Secretary. A new position of Property Officer was created, the aim being to catalogue the club's growing assets and maintain rolling stock maintenance records. Retiring President, Bob Lisle paid tribute to the Bob Kimber's extra efforts in dealing with insurance and re-structuring membership fees.

At the track day on the following Sunday, long time member and former Mayor of Maryborough, John (Jock) Anderson was honoured with Life Membership in recognition of his ongoing support. Whilst he was Mayor, Jock was instrumental in the siting of the track in its present location in Queens Park.

Model Engineers & Live Steamers Assoc. Maryborough

Location: Queens Park, Maryborough

Public Running: Last Sunday

Cobden Vic

Cobden's miniature railway park has netted the town a state award in this year's Tidy Towns Competition. The railway park took out the best tourist attraction at the awards ceremony in Lakes Entrance, beating some pretty stiff competition. (*We'll done ... Ed.*)

South Western Model Engineers Inc.

Location: Grayland Street, Cobden

Public Running: 3rd Sunday each month

What has your club been up to?

We all like to keep in touch!

Send a brief note to tell us!

Or post a copy of your newsletter — but make sure you use a highlighter pen to show the item you'd like us to publicize. Remember to concentrate on news that appeals to AME's wide range of readers.

A V-Twin Oscillating Engine

By Bob Ellis

drawings for publication by Rod Heslehurst

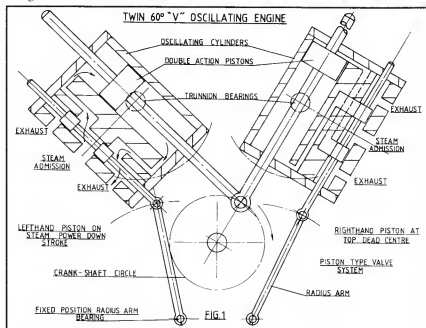
This engine is a 60 degree oscillating V-twin. The cylinders are double acting with a bore and stroke of $1\frac{1}{2}$ " x $2\frac{3}{4}$ ". At the time of writing it had only been run on air, hence the plastic pipes in the photograph.

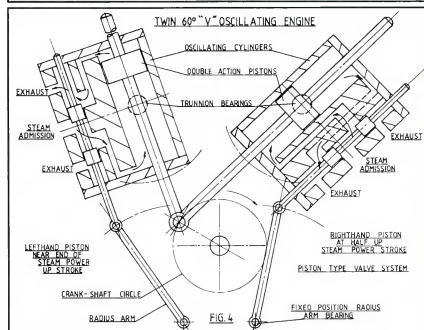
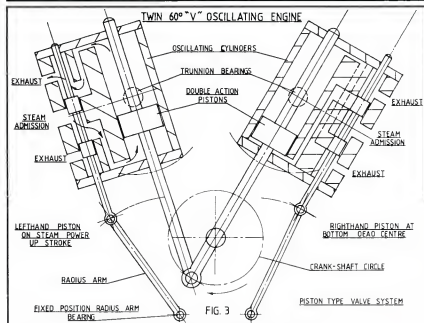
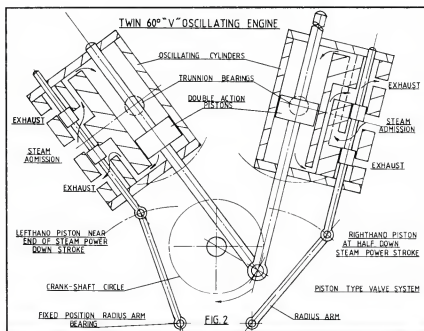
The valves are conventional piston type with inside admission and a single-throw crankshaft is used. The basic valve motion is as per drawings but modified with an eccentric, primarily to allow the provision of 'lead'. The eccentric rods are the 'master and slave' type on a single eccentric strap. The use of two eccentrics may be better as the valves are on opposite sides of the cylinders and reversing gear would be a practical addition. Piston tail shafts are used to prevent misalignment of piston and cylinder at bottom dead centre while the cylinders rock in heavy trunnions. The use of some sort of flexible steam joint will be necessary at the inlet to the steam valves, due to valve chest motion. Locomotive practice is crawling with such devices so the fitting of same should not be a problem.

The engine may look a bit strange but when it comes to building model engines my preference is for "contraptions" rather than beautifully machined and finished scale models. While oscillators may be looked on as toys nowadays, there have been a few full size engines built, the most notable being the main engines of the ss *Great Brit-*

ain. In conclusion the engine uses a built up crankshaft and the frame is fabricated from angle iron. The main, bottom end and trunion bearings are all split shell brass with $\frac{1}{16}$ " shims between the halves. The engine runs happily at 25 psi and ticks over on 8—10 psi.

The accompanying drawings, Figures 1 to 4, show a representation of the same cylinder at various points in its cycle, showing valve operation due to the 'swing' of the cylinder. The total valve chest relative travel is $\frac{1}{2}$ ". The valve rod is fixed at the lower end, and therefore has no linear travel other than that produced by angular variation of the rods at the upper joint. Valve chest travels over the valve, not vice versa.





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Beginner's Choice

by Scott Robertson

I think it is timely to discuss some of the more common concerns of new comers to the hobby. If you are new to Model Engineering and have asked yourself questions like....Where do I start? Is a small engine easier to build than a large one? What type of engine should I build?.....Then read on!

As President of the Bankstown Steam Locomotive Society 1, for several years welcomed all prospective and new members to our club. Among other things the new members invariably ask the same questions, especially regarding what type of engine to build. Small engines must be easier to build than larger engines?. The answer is relatively simple. Engines large and small are made up of the same basic components. However there are some important matters to be considered before hand.

Workshop

One of the principal points to be considered before deciding on the engine to build is the size of your workshop. What available space do you have in your workshop? You will need space for a lathe, a mill or a mill drill plus the other smaller pieces of equipment. For example a grinder, space to store material, space for sets of draws to hold taps and dies, nuts and bolts, etc. and of course plenty of bench space.

From personal experience regarding the sizing of my own workshop, the decision is similar to choosing the size of garage I wanted. I just thought of the size of garage I could get by with and then doubled it! This philosophy worked so well that only then did I have enough room for the cars, workshop and all the other bits and pieces' one usually keeps in a garage. Then look in your wallet and see what sort of decision can be made.

Size of Machinery

The most important piece of machinery required to build a locomotive is a lathe. The lathe in particular has to be large enough to cope with the size of the engine you could or would like to build. This together with your mill or mill/drill has to fit into your available workshop space. Naturally the bigger the machinery the more it will cost. Not to worry, because if you look after your machinery, its value will appreciate in time. As an example, when I decided to upgrade to a larger lathe I sold my 5" swing lathe that I had bought ten years earlier. I had gained much experience on that lathe. Making the usual beginner's mistakes, I had built most of my C32 loco on it. I gave it good clean up, advertised and sold it for just over double what I had paid for it.

Something to consider when positioning your grinder in the workshop — keep it as far as possible away from your lathe. The dust

from the grinder can settle on the lathe bed and thus cause premature wear.

Transportation

Another important aspect to be considered is the fact that the larger the locomotive the heavier it will be. Remember you will have to manhandle your creation during its construction, and when it is finished, load and unload the engine from your car, van or trailer at your club track. There are generally plenty of willing hands at your club to help you with the unloading. In many cases clubs have roll on roll off facilities that make life a bit easier. It is really your own facilities for moving your engine around the workshop during construction and transferring it to and from your car, that you should consider. There are many and varied methods of accomplishing this. Just talk to fellow members about how they go about it. Besides it's a good excuse to go visiting to see first hand. We all enjoy fellow hobbyists paying us a visit for a good old yap!

Skills

To build a model locomotive the main attributes required are patience, the ability to work with your hands and large amounts of enthusiasm. If at present you do not have metal turning skills do not despair. If, like me, you need to learn whilst you build your first engine, there are courses available through most TAFE colleges. These workshop practice classes as they are known, are at night and cover subjects like fitting and machining and boiler making. In these classes you work on your own engine components, under the guidance of the TAFE teachers. There are no formal studies involved, it's only the practical aspect of the work. You may find there are members of your club already attending these courses. So it nearly becomes a social night out with the boys.

Detailing

The one thing that adds time to a project in large engines is detail. By detail I mean rivets, lamps, ladders, cocks, pipes, name boards, decals, etc. How much detail should you, or could you put into your creation. Before you start, or as you get into your engine, form a picture in your mind of your completed locomotive. How much detail you would like to see on it — you have to plan for it.

As an example, in our club we have a number of experienced builders who do not go for the Nth degree of detail. They build their locomotives faithfully, but without the thousands of rivets, etc., and consequently there is a large saving in time. The engines still look good and correct when you see them running on the track. From a distance they look like a 38 or a 26 class, etc. and they look great!

The detail on an engine is really appreciated in the steaming bay. This is where a close up look reveals the difference. This is where your lower jaw drops and you think "How on earth did he do that?" As you can see from my observations, speaking and listening to members of many clubs, the size of the engine does not have a great bearing on how long it takes to build, it's the amount of detail — hence the time spent thinking about, planning and making the detail correct. Think ahead during construction to incorporate those all important little bits and pieces. So when deciding whether to detail or not to detail, take into account the time you want to spend and your feeling of pride when your engine is admired.

Conclusion

Now to the question of engine size and type. Small, medium and large locomotives all have wheels, axles, axleboxes, frames, cylinders, pistons, valve gear, connecting and coupling rods, etc. The significant difference between large and small engines is the number of wheels, the length of the frames and whether or not there is a tender to build.

After several visits from prospective members in recent times and whilst showing plans of the locos that I have and explaining the differences, it occurred to me that an introductory article in AME would help newcomers by explaining that all engines consist of the same or similar components. It's really only the size of the components that differs.

There are some first time builders in our club, building Simplex's and other smaller engines. They chose these designs because they thought they would be easier. In discussion at our track recently, I was told that some members are regretting having chosen a smaller sized engine. This is often for the simple reason that it is harder to get their hands in to work on the engine. When building a larger design, parts are larger and easier to handle. Areas like the smokebox have more room for fingers, cabs are larger, more open and its easier to drive and fire the completed engine.

Basically most locos have a minimum of four coupled wheels although there are a few designs with one pair of drivers. Build a NSW C32, C36, a Queensland class loco or a prototype loco from another state or country. Over a smaller perceived engine the only basic difference is a few more wheels, longer pieces of metal and maybe a tender. The range, quality and availability of local plans and castings are excellent. By building a local product you have the advantage of being able to easily contact the designer if you need to.

So all you need now is time, a workshop, equipment and some money. And more important than any of the above, an understanding and supportive partner!



A Great Eastern Tram

Part 5 concludes the construction series of a 5" gauge battery-electric powered tramway locomotive

by John Campbell

Photos by the author unless otherwise noted, drawings for publication by Peter Manning

Controller

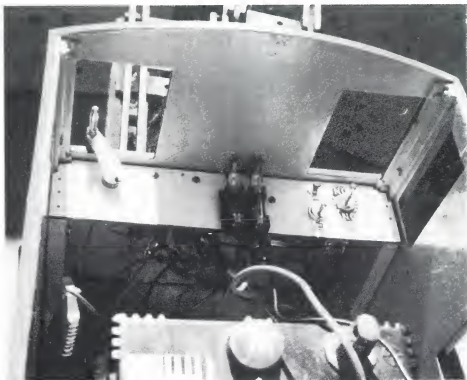
The controller is built onto a table or bench which is attached to the rear end of the inner floor made of 5mm plywood. Four blocks of wood are attached firmly to the floor to locate the battery and clips are provided to hold it in place. The main wiring which may be bought at a car parts shop should be capable of carrying 25 amperes while the relay circuits and wires to the buzzer and headlight may be much lighter.

Most of the control components were bought at Tandy Electronics and I am sure that other stores have similar items.

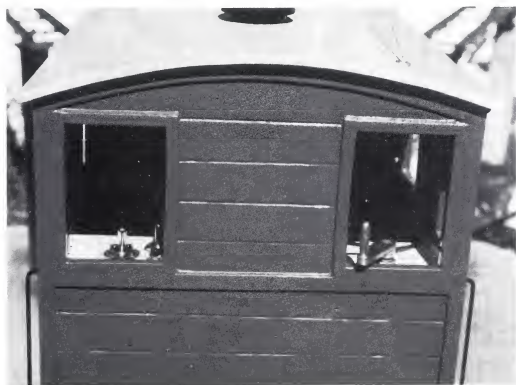
Starting at the battery I use alligator clips. These are easily removed to immobilize the loco. These leads should include a fuse or a 20 ampere car circuit breaker before going to the reversing switch which has a centre-off position. The leads then go to the 30 ampere relays and motor. There are three relays, two are connected to resistors while the third provides a direct connection to the motor.

Resistors

My original resistors were converted electric jug elements. The resistance wire was carefully straightened and made into an eight strand wire. Some experiment will be needed to determine the required length of wire for



The control panel area inside the tram cab.

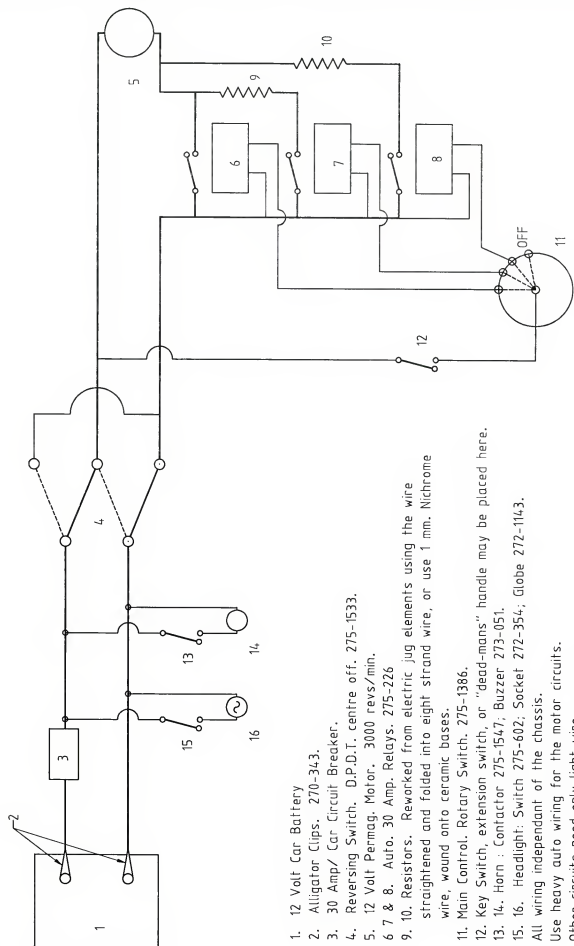


each resistor. I have recently obtained from General Mica Supplies in Melbourne some 1mm Nichrome wire which is more suitable for use in the air. This has been wound on the same jug element formers. As a guide the high resistor has seven turns of wire and the low one three turns. The use of resistors is wasteful in power and all running should be in straight circuit with the resistors used only for starting.

The leads to the headlight and buzzer are taken from the main switch feeds and have a switch and press button respectively.

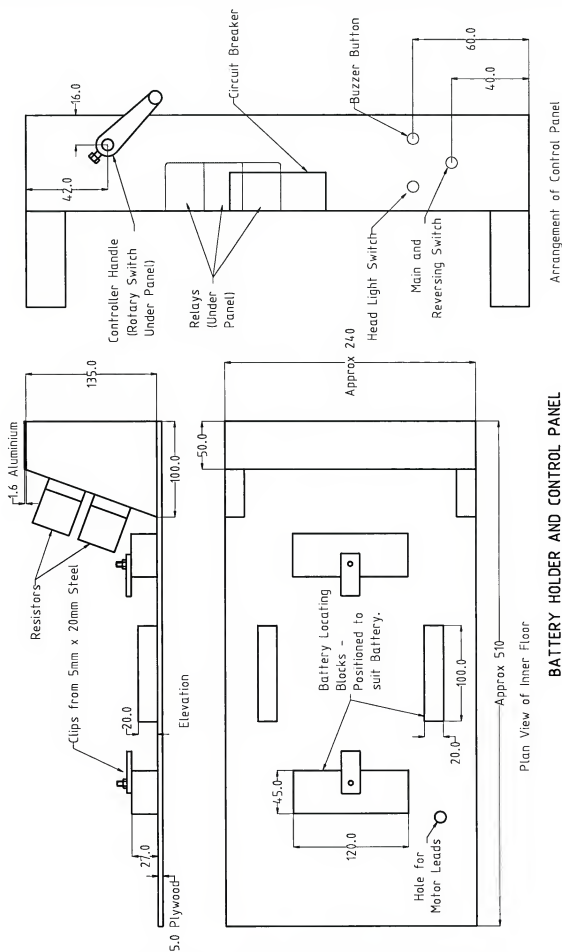
There is a tram type control handle which operates a rotary switch to the relays. This switch has to be placed in the center of one of the windows so that it can swing sufficiently.

Left: a driver's view of the control lever and switches.



1. 12 Volt Car Battery
 2. Alligator Clips. 270-343.
 3. 30 Amp/ Car Circuit Breaker.
 4. Reversing Switch. D.P.D.T. centre off. 275-1533.
 5. 12 Volt Permag. Motor. 3000 revs/min.
 - 6 7 & 8. Auto. 30 Amp. Relays. 275-226
 9. 10. Resistors. Reworked from electric jug elements using the wire straightened and folded into eight strand wire, or use 1 mm. Nichrome wire, wound onto ceramic bases.
 11. Main Control. Rotary Switch. 275-1386.
 12. Key Switch, extension switch, or "dead-mans" handle may be placed here.
 13. 14. Horn : Contactor 275-1547; Buzzer 273-051.
 15. 16. Headlight: Switch 275-602; Socket 272-354; Globe 272-1143.
- All wiring independant of the chassis.
Use heavy auto wiring for the motor circuits.
Other circuits need only light wire.

SCHEMATIC DIAGRAM (Part numbers from Tandy Electronics catalogue)



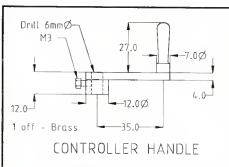
BATTERY HOLDER AND CONTROL PANEL

Plan View of Inner Floor



Lance Durham's tram and trailer combination.

Photo: Lance Durham



A key switch may be placed in the rotary switch circuit if you wish and a dead-man's handle in the form of a press switch on an extension cord may be put in the same circuit. With a permanent magnet motor there is little chance of a high speed runaway.

Brakes

I have not fitted brakes to my locos relying on the hand brake on the driving car. I have had thoughts of adding a 12 volt compressor which could provide air for air brakes and a whistle or alternatively might be used as an exhaustor for vacuum brakes. A hand brake would be useful at times for parking.

The crew

The loco is complete now but if you are really building it for children to enjoy you may wish to add a scale crew.

The driver and fireman are sawn from 20mm soft wood with an added 10mm piece glued to the front of the head. The feet are also glued to the legs and a small nail will give added strength. The body is rounded off and the head carved to shape. You may find it

easier to do as I did and build up the cars and nose with body filler. The arms are made from 8mm dowel attached by screw eyes. At this stage the men remind me of Easter island statues but they look much better when they are painted and are wearing their uniforms.

Crew uniforms

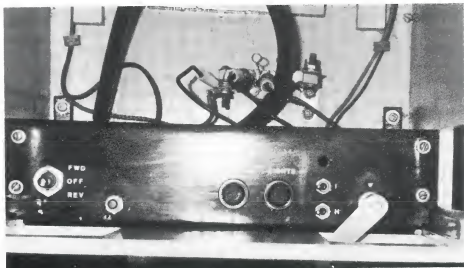
If you have great powers of persuasion or offer suitable reward you may be able to find expert tailoring assistance at home which will save you from some dainty work. The uniforms are made from light-weight material which looks like denim. Some sewing is needed while fabric glue is used in other places.

The trousers need to be a loose fit to go on over the shoes. The turn up of the cuff is glued with fabric glue and the



Leigh and Laura Durham taking the tram for a spin at the Altona and South Western (Victoria) track

Photo: Lance Durham



A view of Lance Durham's tram controller. As you can see Lance has added a personal arrangement to the original layout.

Photo: Lance Durham

trousers are glued to the body at the waist line.

The well dressed engineer often wore a red scarf. A scarf can be simulated with a 5mm red ribbon glued around the neck of the crewman to fill in any space around the coat collar.

The coat is cut to size and sewn on the side and under the arms. The opening for the neck is cut and the coat front is cut on the mid line. A collar is folded up and glued on and the hem and cuffs of the coat are turned up and glued. After placing on the crewman the coat is glued on the mid line. Silver buttons are simulated by spots of fabric paint.

The hats are made from the same material glued onto pieces of thin cardboard. The tops need discs 38mm in diameter and two strips 6mm wide 110mm long form the bodies of the caps. Put a small dab of glue in the centre of the disc and glue it to a square of material. Trim around the disc allowing about a 5mm overlap which is turned over and glued. Clothes pegs make very useful clamps at this stage. A piece of material is glued over the cardboard strip. Bend the strip into a circle to fit the driver's head and glue with a lap joint. The rim and top are now glued together. The peak of the cap requires a crescent shaped piece. Take a circle of cardboard 40mm di-

ameter and cover as the top. The depth of the peak is 7mm. Cut out the peak, curve it to fit and glue it in place with the joint of the rim at the back. Trim and glue any loose ends and touch up any exposed cardboard with blue ink. A cap badge is placed with gold fabric paint and the cap is ready to be glued to the crewman's head at either the correct or a suitably rakish angle. Don't forget suitable reward for your tailor's assistance.

When the crew are completed they are attached to a strip of plywood which is then screwed to the floor of the loco.

Tram constructors

How about all those busy builders following this story sending in a photo and short description of your efforts. Maybe one day there will be a GETE (Great Eastern Tram Engine) rally to rival the *Blowfly* rally!

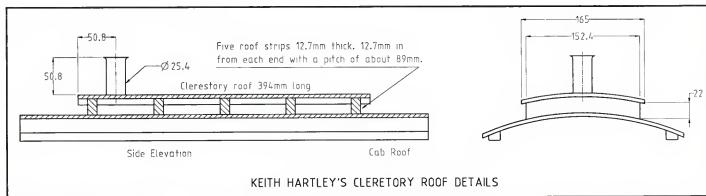
Conclusion

I think that this completes the project. Your real reward for your efforts in building and running the loco comes from the expressions of surprise and pleasure in the eyes of small children who come to ride at your track.

My loco runs regularly at our public days and with the preferred load of driver and three not too large children will run for about two hours on one car battery. I am sure that you will receive as much pleasure as I do.

Coming up next...

Commencing with the next issue, John continues with a suitable riding car for the tram engine.



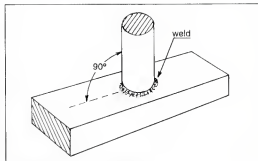
If you liked the look of Keith Hartley's clerestory roof as shown in a photo in the previous issue, here's how you can make it. It simply consists of five battens curved to fit the original roof and a layer of ply attached to the top. It gives it a "Sydney Steam Tram" look.

Square That Drill Table

by Ed Murrell

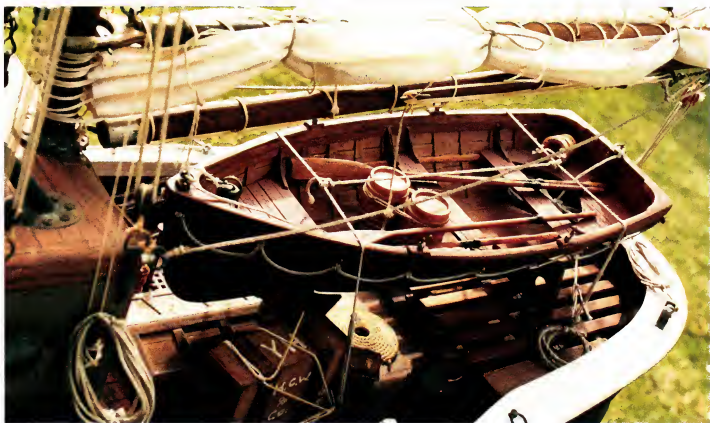
I have a small bench drill which has a useful table that can be set at varying angles to the drill. After it has been used at an angle, how is it quickly returned to horizontal and square again? Using the Tee piece described, it is quick and easy. Place it in the chuck and lower it to the table. The table can be adjusted squarely against it.

The Tee piece is a piece of 12mm round bar with the ends squared in the lathe. This is clamped to a piece of 12mm square x 150mm long bar and arc welded at 90°. Clean it up and there you are!



Henry C Wells

Brian Lemon offers some tips on how he took these great photos of his model fishing drifter.



The close up detail of the dinghy on the stern (*above*) was taken with a wide angle 28mm lens. Sunrise o'er the *Henry C Wells*, taken at 8.00 am (*left*), shows the drifter moored alongside a model jetty. As it was taken partly into the sun, the shutter speed was 1/250 at f11. The bow-on shot (*below*) was taken with a tele. lens and is quite spectacular. Sharp focusing is essential. Note the reflections highlighting the bow wave!



Transporting Locomotives

by Ron Chiddy

photos by Gary van Kleef

In the November-December issue of AME, Ian MacDonald raised the issue of transporting locomotives. This is how I do it.

I have an 0-6-0 *Blowfly*, tender (Barry Potter), two riding cars (Ross Bishop-Wear) and one water carrying "bum truck". I take these to clubs all over NSW as well as some in Queensland, and I have to travel on some shocking roads, a few of which are dirt. I have never lost anything or had any of my gear move, and anyone who knows me will tell you I carry a lot of extra gear!

Photos 1 and 2 show the inside of my HQ Holden ute and the track welded to steel sleepers which are in turn welded to the floor. Note that each track has a length of chain welded to the sleeper at one end and a turnbuckle at the other. The middle track also has a centre nut to secure the engine and tender in place as in **photo 3**. The centre bolting tool shown holds them down tight so there is no bouncing and therefore they cannot jump off the track.

Photos 4 and 5 show engine and wagons securely stowed for transport. (**Photo 6** is the

same set-up in my 8' x 5' trailer.) As can be seen, there is plenty of room for other gear like tools etc. plus my removable bed which goes to one side of the ute on long trips (people have said I spend more time on the track than in bed...).

In a station wagon I would weld an extra steel frame to fit the wheel arch, the weight of the engine, etc. This can then be left out or put back in when needed.

A lot of people have seen what I have done and used the same set-up. It works!



Photo 1

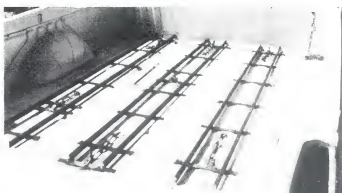


Photo 2

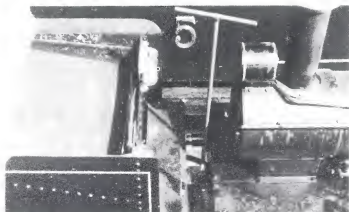


Photo 3



Photo 4

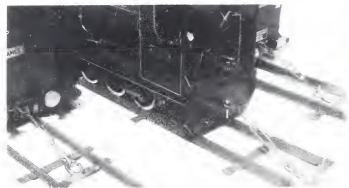
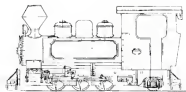


Photo 5



Photo 6



The Bundaberg Fowlers

by Gerardus Mol and David Proctor

The Queensland sugar industry has long been known amongst railway enthusiasts for its great variety of locomotives both quaint and impressive, operating on predominantly two foot (610mm) gauge tracks. From late last century right up until the early 1980's, cane was hauled from the farms to the mills for crushing by steam locomotives. These came from Britain, Germany, France, America, other European countries as well as Australian built ones from Perry Engineering in South Australia and the Bundaberg Foundry Company in Queensland. The last steamers in service, those from the Bundaberg Foundry, were directly descended from the very first steam locomotives devised to serve agricultural industries.

Origins

The light railway technology used for the sugar industry was developed by a French farmer and engineer, Paul Decauville and the English firm of John Fowler & Company. Decauville grew sugar beet on his large estate at Petit Bourg, near Paris, where he used Fowler steam ploughs, which he began to manufacture under licence after 1867. To harvest and transport his crop, in late 1875 he devised a rail system, *Decauville's Iron Carrier*, and in 1882 he began designing locomotives. In 1877 John Fowler & Co took out a licence to manufacture *Decauville's Iron Carrier* and subsequently incorporated improvements of their own.

Sugar cane tramways first came to Australia when John Spiller commenced construction of a tramway on his Pioneer plantation near Mackay in 1879, to the Queensland Railways gauge of 3ft. 6in. (1067mm). He started haulage with a locally built locomotive in August 1880 and the following year, imported a locomotive from John Fowler & Co.

The Fowlers

From this early beginning, the Fowler locomotives grew to become the most popular in the sugar industry, with around 140 being in service. John Fowler & Co were prolific builders of light railway locomotives until 1937, when they ceased production. Their final order was for two virtually identical locomotives for the Queensland cane fields. They were

- Builder's No. 20763 0-6-2T for the Kalamia mill, Ayr *Airdmillan*
- Builder's No. 20764 0-6-2T for the Pleystowe mill, Mackay, No. 8 *Airdmillan* was the last to be delivered and still exists (only just) at the Australian Narrow Gauge Railway Museum in Woodford, Queensland.

After Fowlers ceased production, the demand for locomotives, their product in particular, continued to grow in the cane fields. In fact orders

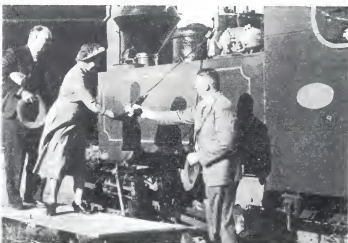
were still sent to them, optimistically, and one of these was actually filled by Hudswell Clarke for the South Johnstone mill. It carries builders numbers from both Hudswell Clarke and John Fowler & Co.

Enter the Bundaberg Foundry Co

In view of this demand, the Bundaberg Foundry Co. acquired the drawings of the last two Fowler locomotives and obtained approval to build them under licence.

World War II stopped any thought of locomotive building, however, but once the war was over, work began on modernising the drawings to make use of the latest technology. The modifications included welded cab, bunker and tank sides instead of rivets, and roller bearings were fitted to all axles in place of plain brass bearings to make the locos very free runners. There were also other minor changes made.

Production started in 1952. This was the first time that the Bundaberg Foundry had built steam locomotives, but they had performed locomotive overhauls for the Queensland Railways during the war years as well as some contract work on the Australian Standard Garratt



Mr T Barion, Asst. Manager of Bundaberg Foundry hands Mrs Price a bottle of Bundaberg Rum to christen Bundy Fowler No.1, while BFC General Manager, Lindsay George looks on. Photo: G Mol collection

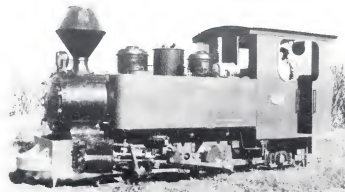
locomotives for the Commonwealth Land Transport Board.

Due to the growing popularity of the diesel engine, there were only nine locomotives ordered from the Bundaberg Foundry, only eight of which were ever completed, the ninth being cancelled very early in its construction. There were nine sets of drawings made, one for each order, and each set was different in some way to the others. The differences reflected the preferences of each mill in things like cabs, buffer beams, couplings, chimneys and one in fact being an 0-4-2T, but using the same tanks, boiler and cab as the others.

The Bundaberg Fowlers

The Bundaberg Foundry constructed all the locomotives in their own workshops, with the only parts bought in being injectors, safety valves, roller bearings, axleboxes, turbo-generators and the Delvac lubricators.

When Bundaberg Fowler No. 1 was completed she performed her steam trials on the rails of the Bingera mill, near Bundaberg, and on Mon-



Bundaberg Fowler No. 1, still fairly new, poses in the cane fields of the Bingera Mill near Bundaberg Photo: G Mol collection



"Bundy Fowlers" Nos 1 and 6 nearing the end of their careers at the Millaquin Mill, Bundaberg

day 2nd June, 1952, a Mrs Price smashed a bottle of good Bundaberg Rum over the locomotive for its christening. From that moment on the "Bundy Fowlers", as they are commonly referred to, proved themselves to be outstanding performers and were very popular with loco crews and mill owners alike. They were to be found in the canefields from Mossman in the north, down to Bundaberg. All eight are still in existence, with three of them regularly in steam.

The Bundaberg Fowlers were built as follows:

No. 1	1952	0-6-2T	for Millaquin mill, Bundaberg	<i>Jumbo</i>
No. 2	1952	0-6-2T	for Mossman mill, Mossman	<i>Bundy</i>
No. 3	1952	0-4-2T	for Millaquin mill, Bundaberg	<i>Nipper</i>
No. 4	1952	0-6-2T	for Bingera mill, Bundaberg	<i>Ralf</i>
No. 5	1952	0-6-2T	for Pleystowe mill, Mackay	
No. 6	1952	0-6-2T	for Millaquin mill, Bundaberg	<i>Dobbin</i>
No. 7	1953	0-6-2T	for Bingera Mill, Bundaberg	<i>Kolan</i>
No. 8	1953	0-6-2T	for Proserpine mill, Proserpine	
No. 9	1953	0-6-2T	for a Mr Andersen—never completed	

in Austria and Hunslet in the UK. More recently they have been very heavily involved in the re-gauging of ex Walkers Ltd diesel hydraulic locomotives from NSW (73 class), QR (DH class) and WA (M/MA class) to 610mm gauge for many of the sugar mills.

Retirement and preservation

Dieselisation came quickly to the sugar industry and by the 1970's many of the Bundaberg Fowlers were finding new homes. Mossman



This view of the valve gear on BFC No.1 shows the offset expansion link and double combination lever which were a feature of all Fowler locomotives with Walschaerts gear. This allows the valve centre-line to be directly above the piston centre-line. Photo: G Mol

Some of the locomotives were named as stated above, but names did tend to move around a bit and some of them have carried more than one name over the years.

Just how far work progressed on No. 9 is difficult to ascertain as interviews with former Foundry workers differed greatly, from frames and castings being completed to only the frames being cut out. After all, it is 45 years since they were built and the people interviewed had left the company many years ago.

The Bundaberg Foundry is still in the cane locomotive business, having gone on to build diesel locomotives under licence to Jenbacher



The unique style of cab fitted to No. 3, the only 0-4-2T, is clearly visible here. Photo: G Mol



No. 6 seen here as Bally Hooley on the tourist service operated for some years by the Mossman Central Mill. Photo: G Mol collection



No. 5 emerges from the pine trees on the ANGRMS's Durundur Railway at Woodford
ANGRMS publicity photo

sold their loco to Alan Robert in 1971 for preservation. Others sold or transferred their locomotives to other mills, many of them ending up at Millaquin and Qunaba mills near Bundaberg by the late 70's. Qunaba's tramways were the last stronghold of steam, remaining steam operated until the mill's closure at the end of the 1985 season.

The current location and status of each of the locomotives is as follows:

- **No. 1** — has been retained by the Millaquin mill and is stored within the mill complex, being slowly encapsulated into the works as the mill expands. Reputed to have had a complete overhaul prior to being placed in storage.
- **No. 2** — was purchased by the Mossman mill for the now discontinued Bally Hooley Express tourist service. Stored in the open at the mill and believed to be for sale.

- **No. 3** — the 0-4-2T, was donated to the Bundaberg Steam Tramway Preservation Society, where it regularly steams on their railway in the Bundaberg Botanical Gardens
- **No. 4** — after going to the Goulburn Steam Museum and then the Lachlan Vintage Village in Forbes, now owned by Warwick Turner and stored in Echuca.
- **No. 5** — regularly hauls tourist trains at the Australian Narrow Gauge Railway Museum Society at Woodford in Queensland.
- **No. 6** — like No. 2, purchased for the Bally Hooley Express and now stored in the open at Mossman mill, believed to be for sale.
- **No. 7** — after many years under cover at Boyd's Antiquarium in Bundaberg, was purchased for restoration and now regularly runs at the Coal Creek Heritage Village, Korumburra, Victoria.
- **No. 8** — in a dismantled state on Graham Chapman's property on the northern outskirts of Brisbane.

A short revival

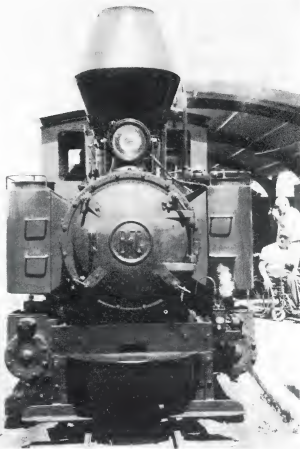
In August 1997, the Moreton Central Mill at Nambour celebrated its centenary. As part of the celebrations, Bundaberg Fowler No. 5 was transported from Woodford to operate on the mill tramway. It spent a week there, hauling cane from the reception yard at the edge of town,



A brightly coloured No.6 hauls the now discontinued Bally Hooley Express in tropical north Queensland. Photo: D Proctor collection



BFC No.7 has recently found a new life hauling passengers on 2 kilometres of track through the Coal Creek Heritage Village at Korumburra in Gippsland, Victoria.
Photo: courtesy Coal Creek Heritage Village



These two views of No.3 show many of the features that all the Bundaberg Fowlers had in common as well as some detail differences. In this case, note the handrail on top of the tanks, the buffer block and the guard rail underneath. Both photos are taken at the Bundaberg Botanical Gardens. Photos: (above) D Proctor and (below) G Mol

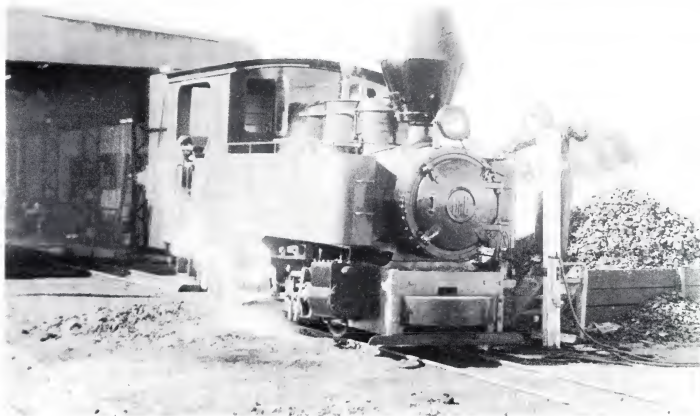
up through the town to the mill. As the mill required the cane, No. 5 would steam down the middle of the street to the yard and return with 45 to 48 loaded cane trucks, weighing approximately 300 tonnes. This created a great deal of interest as it was 29 years since the last steam locomotive travelled up the main street of Nambour, and 30 years since No. 5 had hauled a load of sugar.

How about a model?

The considerable detail differences between these very successful and robust little locomotives, provides wonderful scope and variety to the would-be modeller of them. Some years ago, in the original AME, a construction series for a model of the Bundaberg Fowler, called *Bunyip*, was started, but had not got very far when changes to the magazine brought it to a halt. Due to the high amount of interest that has continued to be shown in these locos, and the continuing trend to larger models, AME will be re-visiting *Bunyip* in the near future. Because many early issues are becoming harder to obtain, the series will commence from the beginning and will include some novel changes. As they say — *stay tuned!*

Bundaberg Fowler 0-6-2T

Cylinders	10" x 14"
Driving wheels	2' 4"
Tractive effort	7200 lb
Boiler pressure	180 lb
Tank capacity	510 gallons
Bunker capacity	37 cu. ft.
Weight (working order)	21 tons
Heating surface:	tubes 302 sq. ft.
	firebox 34 sq. ft.
	total 326 sq. ft.
Wheel arrangement	0-6-2T (No.1,2,5-8)
	0-4-2T (No.3)
Gauge	2' 0"



A Day in the Park

by Gerardus Mol

photos by Gerardus Mol and Melanie Dennis

In 1865 the Queensland Government ordered twelve B class (later A class) 0-4-2 locomotives from Neilson & Company of Glasgow. An additional one was built for the contractors Peto, Brassey and Betts, who were constructing the line to Toowoomba. This loco later joined the ranks of those bought for the Government railways. All told 13 locomotives were built and they differed from the first (2-4-0) locos bought by the Government in having injectors instead of feed water pumps and a trailing Adam's Radial Truck.

These little engines had an interesting career and No 3 was the last one in Government service being shipped north to Bowen to end its days shunting the lightly constructed jetty. In December 1913 it was again shipped south, this time to take part in the celebrations marking the jubilee of the turning of the first sod. After this, the little engine was written off in 1914 and placed on display at the Ipswich Railway Workshops. Here the locomotive stayed until 1936 when it was returned to active service along with 2 four-wheeled carriages for the Railway Pageant which marked the opening of the Railway Department Headquarters in Anzac Square, Brisbane.

Preservation

After the Celebrations were over the locomotive and carriages were placed on display in Countess Street, in Brisbane's Roma Street railway yards until 1959 when, due to extensions of the yard, it went back to the Ipswich workshops for storage. The little train was externally restored for the Railway Centenary in 1965, and taken out onto the main line to be photographed with the *Westlander* outside Ipswich station. It was then returned to storage until 1969 when it was donated to the Ipswich City Council. The train was subsequently taken and placed in Limestone Hill Park (later Queens Park) in its own covered compound. This was meant to be the last resting place for the little engine and carriages.

Over the years the train suffered from the vandals who could not resist the temptation to smash all the glass work in the carriages. If this was not enough, when the glass was re-

placed with ply, painted to look like glass, the vandals smashed them too.

In more recent times the little train received some unwelcome visitors who cut through the wire compound and camped in the carriages. This worried the City Council, as there was always the danger of the historic carriages being set on fire and destroyed. Concerned about the welfare of these historic exhibits, the Council offered to return them to the Railways who readily accepted.

Retrieval

On Thursday, 9th October 1997, the big day arrived for the train. At 8 am the first truck arrived with railway workmen from the Redbank Railway Workshops under the supervision of Rodney Brown. Their first job was to rope off a large area to keep the public

So the slack was taken up, and at 10:23 the locomotive rolled forwards for the first time in 28 years. Rodney needn't have worried about the loco's wheels refusing to move, because as soon as she started to roll it must have felt freedom, as she rolled out into the sunshine with no effort at all (Photo 1). Stopping it almost became a bigger problem once it had started to move. With its allocated task completed the truck moved off and it was now the turn of the tender to be moved forward using a pinch bar and some man power, soon followed by the two carriages (Photo 2). Again, there was almost no stopping them once they tasted freedom, as they rolled freely once the dirt and rubbish had been cleaned from the grooves in between the rails.

Proceedings now came to a stop while we waited for the road crane to arrive and it was

around this time that we met Bob Latter from the Ipswich City Council. While we were waiting it was decided to remove the bronze plaque detailing the placement of the locomotive back in 1969. This involved a lot of jack hammering as the plaque was well and truly affixed to its mounting block. We then asked permission from the Railway supervisors to go into the restricted area to take some photos. This we were given as long as we were out when work started again. We were soon taking photos and

climbing all over the engine and carriages while everything was at a standstill.

The big lift

Soon the crane arrived and was positioned in front of the locomotive and with all the lifting gear in place a trial lift was commenced. It was soon discovered that the running boards on the side of the engine would bend under the slings, so the load was released and the front running boards removed. Again the slings were slung under the locomotive and the trial lift recommenced, this time with success. This pleased Rod Parkinson and his crew, from the Ipswich Workshops as he is the man in charge of the



Photo 2

(and us) at a safe distance, then it was time to remove the wire mesh and the two rows of concrete blocks at the front of the compound. Once completed, a length of portable track was placed in front of the locomotive and bolted to the concrete compound floor and spiked into the turf. The portable track was constructed in the Redbank Railway Workshop using RHS welded to flat steel cross members as sleepers. Next the steel angle stops, welded in front of the locomotive wheels to stop it from moving, were removed by oxy cutting them from the rails. Now the locomotive was free to be moved along the track after all these years.

A large pinch bar was brought in to try and move the loco, but the wheels were reluctant to turn. *Had the cylinders rusted solid after all these years?* was the question; no one was sure but as the official handover was scheduled for 2:30 in the afternoon, nothing could be left to chance. A very large salvage tow truck duly arrived and at 10:15, positioned itself in front of the locomotive and a steel cable was placed over the front coupling. All was ready to move the locomotive forward out of the compound, seized cylinders or not.

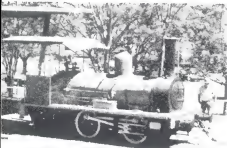


Photo 1



Photo 3



Photo 4

locomotive's current restoration and is the supervisor of the steam locomotive restoration section of the Ipswich Railway Workshops.

The first of three low loaders arrived to transport their historical loads to the workshops after the handing over ceremony. While waiting for the ceremony to start we were again given permission to go into the roped off area to take some more pictures as long as we were out when the official guests arrived. When we were taking photos Bob Latter

thought that Melanie and I were official railway photographers as we were wearing our Queensland railway caps, and we did look official with all our camera gear. He asked us if we could take some photos for the council, and despite our confession of being mere interstate visitors we agreed, as it would give us an "official" reason to mingle with the guests, and mingle we did. Soon the official party gathered and the Minister of Transport, Vaughan Johnson and the Chief Executive of

Queensland Rail, Vince O'Rourke stood on the footplate of the locomotive, had their photos taken, and the engine was duly handed back to the Railways.

Now it was time for the crane to go into action and the loco was lifted (Photo 3) off the rails and swung around onto the first low loader (Photo 4). The tender followed next being placed behind the loco on the same low loader. After securing the load the low loader moved out of the way and the process was repeated with each carriage being placed on a separate trailer (Photo 5). All that was left to do now was pack up and return to the workshops. The truck convoy left the park and headed for the Ipswich Workshops, first going through the middle of the Ipswich shopping centre and then over the Bremer River Bridge through North Ipswich and finally into the Workshops. After taking photos of the procession travelling over the river bridge and through North Ipswich we followed the convoy to the workshop gate. Through the generosity of Rod Parkinson and Rod Brown we were signed into the workshops and photographed the unloading of the train onto the transverser (Photo 6). We then witnessed the final act, in the soft rays of the setting sun, of the small train set being rolled once again into the workshop building after being away for 28 years (Photo 7). Here in the surroundings of the Beyer Garratt 1009, undergoing repair for a hot box, BB-18 1/4 No.1079 under going a complete rebuild and the scattered parts of the AC-16 No. 221A (out of the old Redbank Museum) the little A-10 is about to start the next chapter of its interesting career.

(These two little four-wheel carriages would make great models and being three foot six gauge would be a reasonable size. Does anyone have drawings? ... Ed.)



(above) Photo 5 and (below) Photo 6



Photo 7

Steam Chest



with Dave Harper

Hi there, steam fans, and welcome to another steam miscellany. Thanks to some help from some of this column's friends, I've got some great new stuff to share with you.

First off, John Single from Hornsby, NSW, kindly sent me some copies of a neat little magazine called *Hoyt Notched Ingot*. The issues date from 1959 to 1962 and are apparently the house magazine for the Hoyt Metal Company. I had never heard of the name myself, but asking around my old steam mates showed that Hoyt metal was well known as a bearing metal, a form of white metal, no doubt. Anyway, the magazines have some fascinating snippets in them, which I will share with you over the next few issues. A request, too, that if anyone has any other copies of this magazine that they would consider selling or loaning them to me; I just love collecting old books etc!

One item that John Single pointed out was a picture, reproduced here as **Figure 1**, of an early steam engine which closely resembles the Benson engine recently mentioned in this column, and also a similar old engine pictured in the Sep/Oct '96 AME, (page 17, photo 5) which was seen in Mogo, NSW. Clearly it is of the

same type with the cylinder at the bottom and the crankshaft supported above, in this case on two cast iron columns and a brick wall!

The accompanying notes, in the July 1960 'Notched Ingot' state that a Mr Bruce Macdonald of Homebush, NSW, came across the engine whilst holidaying in Victoria; it bears the makers plate 'Blackwood & Gordon Paisley No 49.' The editors estimate that the engine was built between 1855 and 1870, and say that the flywheel is attached to the crankshaft by the old method of staking (wedging) rather than keying. Paisley, of course, is near Glasgow, Scotland, which was the home of many steam engine manufacturers. Can any of our readers come up with any more information on this engine or the manufacturer?

Another item that seems worth sharing is the front cover picture of the Nov 1961 issue (**Figure 2**), showing a team of men trying to fit a truly humungous spanner on to a nut. The nut is holding one of the propellers of the liner *Queen Elizabeth*, the original one, not the QEII. It also shows the cover layout of the B5 (17.5 x 23cm) sized magazine. More next time!

More Old Beam Engines

Here's another drawing (**Figure 3**) from George Watkins' book on Textile Mill Engines reviewed last issue. It shows a large double beam engine built for the Dalton Mills, Keighley. When this woollen mill was built in the 1860s it was decided to provide the power from a single unit, and this gave us the largest beam engine of which record remains. With a nominal HP of 500, it was designed by Wm Pickup and built by Wm Bracewell of Burnley. It cost 12,000 pounds and took seven years to build!

It was a double, slide-valve McNaught with HP cylinders 45" bore x 4'9" stroke and LP cylinders 60" x 9ft. It ran at 22.5 rev/min on 60psi steam and developed over 2,000HP. The four cylinders weighed 100 tons, the beams were 37'6" between end centres, 4'

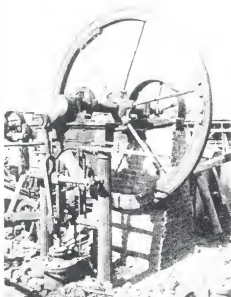


Figure 1



Figure 2

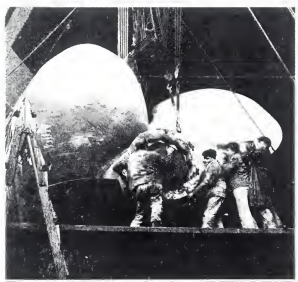


Figure 3

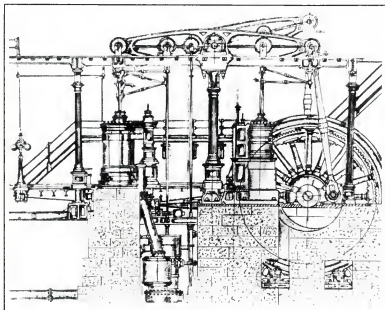




Photo 1

deep at the centre and weighed 24 tons each. The flywheel and driving gear ring weighed over 100 tons!

The drive was by two underground shafts, and it was the failure of one of these in 1904 which, by allowing the pinion to roll under the

gear ring, completely wrecked the engines! Miraculously, no one was hurt in what must have been a truly massive blow-up. The engines were replaced by two horizontals using rope drives. Sounds like somebody learnt a lesson!

It shows that they could build really big engines even that long ago, and they had equally big foul-ups!

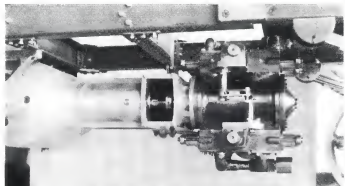


Photo 3

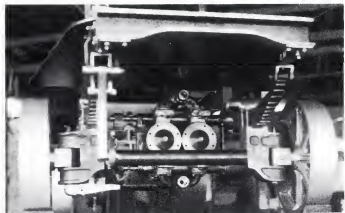


Photo 5

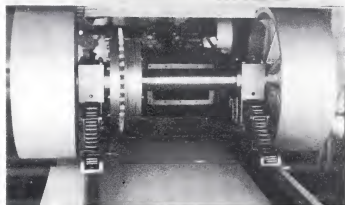


Photo 6

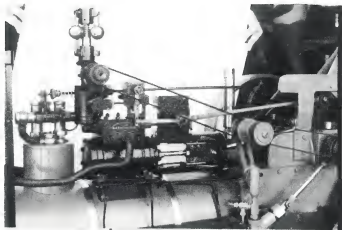


Photo 8

and the lever arrangement for the valve gear. Apparently the camshaft moves axially to change cut-off and reverse; there are three cams of varying lift on the inlet valves, in each direction, with just one elongated cam on the exhaust valve camshaft. Fitting these cams to allow for set-up and adjustment has exercised Hugh's brain more than somewhat! **Photo 4** is a top view which shows the inlet camshaft mounted above the top of the engine as well as the steam inlet and the valve housings.

Photo 5 is a view from the front which shows the massive front axle castings and the springs. As Hugh says, he does light engineering, not model making! Just to round it off, **photo 6** is the rear view showing the chain drive to the diff., the massive rear wheels, and the bottom of the crankcase.

I've long admired Hugh's model Cliff and Bunting traction engine, and took **photos 7 and 8** to share its delights with you.



Photo 10

More On Red Fred

At last the weather has cooled down enough to think about doing some more on Red Fred. At least I got around to taking a few photos to show that he really does exist! **Photo 9** is of the real thing, in case anyone wasn't sure. It was taken at the ARHS mu-

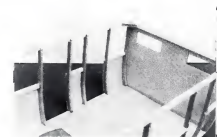


Photo 11



seum at Rosewood, near Ipswich, Qld. where the 45hp Gardner railmotor lives.

Photo 10 is of the body with one side skinned. As the model is to be remote controlled, and is not designed to carry people, I am able to make it light, and to incorporate more detail than most previous models. It will be propelled by a separate box wagon trailer containing the electric motor, battery, radio control etc. so I can furnish the inside as well. Vive la difference!

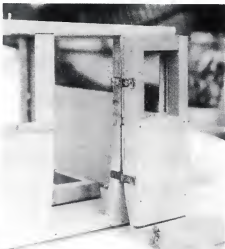


Photo 12

Photo 11 shows the side frames cut from beech timber, spruce longerons and ply skinning all on a "ply base. Can you tell I used to build model boats and planes? Hanging the doors is interesting (**Photo 12**), I had to solder extensions on the brass hinges; the doors are skinned with 0.6mm ply, all seven of them.

Travels With Kenny

Last issue, I left the story of my trip around North Queensland with Ken Saunders last year, with us staying with Peter and Gwen Lukey at Babinda.

Peter kindly gave us a guided tour of the Babinda Sugar Mill, where he



Photo 9

works, before we headed north again towards Cairns.

We wanted to find a lady called Adrienne Hicks, who owns the old gold mine at Tyrconnell, about 150km west of Cairns. We did finally track her down, and were made very welcome. Tyrconnell is one of several old mines that Peter Lukey had recommended we look at on our trip; knowing that Adrienne was in Cairns, it seemed politic to call in on her on the way. We found that Adrienne and her two children, in their twenties, were trying to clean up the old mine site as a tourist attraction, and Adrienne assured us that Cate and Andrew would make us welcome when we turned up there.

Cheered by this information we continued north to Mossman, where, behind the sugar mill, I snapped the Bally Hooley express (**Photo 13**), sitting forlornly in its siding, stalled by public liability insurance problems.

Just beyond Mossman, we came to Pinnacle Village Caravan Park. This is a Mecca for Queensland model train buffs, as the village operator, Roger Anderson, has a great 5" gauge rail track laid around part of the park, through the most spectacular rainforest setting you could imagine. As we wound along the coast, the rainforest-clad hills edged closer and closer to the beach, and just where it seemed the two must meet, is where Pinnacle Village is sited.

Ken was welcomed as an old and valued friend; I think I was so stunned by the surroundings that our hosts, recognising the symptoms, made me welcome, and let me soak up the atmosphere! As the weather was



Photo 13



Photo 14

most un-tropical, cold, wet and windy, we gladly accepted Roger's offer of an overnight van rather than pitch camp.

Early next morning, Tuesday, we headed west, up the range to Marceba, then on to

Dimbula, where we left the bitumen and headed north into the wild mountain country and the Hodgkinson River goldfields.

Ken handled the little Lite Acc van as though it was a four-wheel-drive, and we

bounced our way into the unbelievable desolation of the savannah country. We lunched at the site of Thornborough, once a roaring gold-mine town, now marked only by some forlorn gravestones and a pile of broken glass that marked the site of a pub, one of the four that flourished briefly 120 years ago. For me, a town boy born and bred, it was quite something to sit there and soak up the silence, broken only by the occasional birdsong and the wind rustling the gnarled and stunted ironbark trees.

Following a faint sign, we turned off towards Kingsborough, where we would find the Tyrconnell and General Grant mines. Arriving at Tyrconnell, we were welcomed by Cate and Andrew, who proudly showed us over their mine. I am full of admiration for these two young people who seem content to live in really primitive conditions and work towards fulfilling a family dream. **Photo 14** shows Cate and Andrew showing Ken the overgrown remains of the winding engine and air compressor.

I think I'd better leave it at that for this time, more on the gold mines next issue. Till then, happy steaming!



AME's address is now: PO Box 21, Higgins, ACT. 2615

Morse Taper Shanks

by Alex Russell

The sketch below should be self explanatory, but there is a trick or two in making tapers and from experience I may be able to help a little. If you only intend to use them in the lathe tailstock there is no need for the tang but, in case you may use them where it requires the use of a drill drift to move them I shall include the necessary dimensions. Using a length of $\frac{3}{4}$ " bright mild steel centre one end and with 5" of the metal protruding from the 3-jaw chuck, using a broad pointed round nose tool, turn down the end to $\frac{1}{16}$ " for a distance of $\frac{1}{16}$ ". This portion will have to be formed later by saw and file to a thickness of $\frac{1}{4}$ ". Check this shape from the tang on a No 2 Morse taper drill.

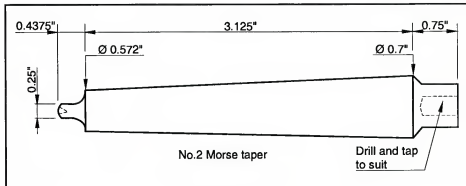
Now set the compound slide over about one and one quarter degrees. You have to experiment a bit with this as no two lathes are ever the same. Take a light cut or two and see how you are going, by first rubbing a piece of soft chalk lengthways along the work. Do this in three places equally spaced around the job and then try a No 2 to 3 drill sleeve, the taper head stock bush or whatever, twisted around the work and the marking so produced will

show up any high spots. If the marking is not even, move the compound slide just a little and carefully take a light cut, use the chalk again etc., etc., 'till you are satisfied you have arrived at the correct angle. Now it is very easy to go that little bit too much, so go carefully!

If you have no sleeve to check the taper you will have to screw out the tailstock quill and use that as your gauge. A real nuisance I know but, what else is there?

As a matter of interest I have made two of these shanks specifically to hold two different sizes of centre drills to save the bother of having to continually change the Jacobs chucks.

Now as you cannot successfully hold a tapered article in the lathe chuck, it is a simple matter to use your lathe backwards (so to speak) that is, put the taper shank in the tailstock and drill and tap it to your needs by using the 3-jaw lathe chuck to hold the necessary drill and tap.



What Size Injector?

by Ted O'Brien

To find the size of injector in ozs per minute, which is how they are rated, we need to know how much steam the locomotive is using. It does not matter how much the boiler produces because provided valve settings and draughting are correct, our miniatures will usually produce plenty of steam even if the full size was a shy steamer. This is due to scale effect.

Full sized locomotives ran with at least one injector on for the whole of the time that the regulator was open except of course in starting when it was not put on until the fire was bright and the safety valves about to blow off. Then one injector was usually put on until the next stop and the water level remained constant in the gauge glass.

When the engine was in good condition, that is with a clean boiler, valve motion all correct, good coal and competent driving the injector was 'fine tuned'. The water valve was partly closed until the injector 'sung' or emitted a higher pitch than when the water valve was fully open and at this point the minimum amount of water that the injector would deliver was feeding the boiler. This operation of the water valve allowed regulation of the amount of water. (This also works on most of the miniature injectors too!). Remember that there are two injectors on a locomotive and in adverse conditions or due to injector failure the other injector was also used.

Performance on models

At Club tracks, I have all too often seen locomotives with injectors that have too large a capacity. These injectors feed a jolly great slug of relatively cold water into the boiler in a relatively short time with consequent loss of steam pressure and it can be observed that both the steam pressure and the water levels go up and down like a yo-yo. The crew on full size locos kept very even pressures and levels and we can achieve this in our miniatures by having the correct size injectors and good firing techniques.

How to find the correct size of injector.

The formula is quite simple if you have a calculator or computer:

Capacity in ozs = Volume of cyl. x 4 x rpm divided by a Factor of .578

Explanatory notes

- Volume of cylinder = $\pi r^2 h$ ($\pi=3.1412$, r =radius of cyl., h =cyl length)
- rpms = revolutions of driving wheels per minute
- factor of .578 = converts from cubic inches to ozs.

Volume of cylinder is multiplied by 4 because one cyl is filled 2 times in one revolution of the driving wheels. Since there are two cylinders we have 4 cylinder fillings with steam per revolution. This then, is multiplied by the driving wheel revs. per minute then divided by the factor from the chart. The result will be in cubic inches of water which we convert to ozs by multiplying by .578.

Additional Factors

By now you are convinced that I am a brick short of a load. What about superheating, adjusted cut-off or admission at full stroke?

Take superheating first, I have been many years experimenting, observing and questioning. If the injector formula is calculated for one locomotive superheated and one saturated, the results are the same albeit just, and only just, favouring the superheated locomotive. (I have often wondered if our superheating is really superheating or just a little dryer than saturated. I will not argue this point it is merely a thought.)

On the point of short cut-offs and 75% - 80% admission at full stroke — whilst it is quite noticeable that running at short cut off reduces the need for water, the high running speed compensates quite well. At the initial cut off of 75% - 80% I think that the remaining 20% - 25% is lost due to condensation and/or leakage. Our cylinder castings are of greater bulk and take the same time to get hot as the full size so time is the factor here.

I find that most miniature steam locomotive cylinders take about the same time as a full sized locomotive to get hot and by that time we have stopped at the station to cool off again. Longer time in running is beneficial.

Adjustments

Now for some adjustments. Full sized locomotives had a driving wheel speed of 375 rpm on average which is the reason that passenger locomotives had 6 feet driving wheels and slow goods engines had 4 foot something diameter wheels.

This where I make the adjustment for all those little inconsistencies of superheating etc. I suggest that you use 200 rpm for scale small size wheels that is 5" diameter in 5" gauge and 7" diameter in 7 1/4" gauge and use 250 rpm for 6" and over in 5" gauge and 9" and over in 7 1/4" gauge.

Coming now to the factor, which can be found in any book of Steam Tables. One cubic inch of water at

80 PSI = 283 cubic ins of steam
85 PSI = 270 " " " "
90 PSI = 257 " " " "
95 PSI = 247 " " " "
100 PSI = 237 " " " "

This table gives us the volume of one cubic inch of water converted to steam at the stated pressure, the pressures given being our most commonly used ones.

Our calculations at this stage will give us an answer in cubic inches of water/minute we now need to convert to ozs/min. One pint of water equals 34.6 cub. ins. and one pint equals 20 ozs. We now multiply by .578 to give us ozs per min.

From my own experience using the above formula, my calculations for my 5" gauge NA class Puffing Billy engine worked out at 22 ozs/min. The 24 oz injector will slightly gain the water level by about 1/8" in the glass after 15 mins.

Another locomotive required 28 ozs/min and a 30 oz injector was fitted which gave similar results. However after some time the valve gear was adjusted to give longer travel and longer laps. The valve setting was .010" lead and port opening was made equal at each end of travel when the valve gear is set to the running notch (3rd), and now a 24 oz injector maintains and slightly gains on the boiler water level. I mention this because it was well known in full size that valve setting was critical to water and coal consumption, proving again that our size locomotives are exactly the same as the full size.

Model as a blueprint

I wonder how many model engineers realize that when an engineer was designing a new concept of machine or plant he would build a model to test his ideas and if the model worked or showed shortcomings he could correct it very quickly and cheaply, knowing that the full size version will behave in exactly the same way. In our miniature locomotives we are reversing this process — therefore what worked in full size will certainly work in miniature.



Hardening H.S.S. Tool Steel

Should the lathe tool not hold its edge, try hardening it. You will need an oxy. set and the blue glasses. Rough grind the tool then heat slowly to a white heat, running the heat back from the cutting edge, otherwise cracking could occur. View the cutting edge through the blue glasses, and when it just starts to melt little bubbles will appear. That is when the change takes place — it can now be cooled in the air, or when it is black, to hasten it, cool it in kero. Any faster cooling will also cause cracks. Forging can also be done at white heat.

E.J.M.

5" Gauge Electric Outline Petrol Powered Loco

Story and photos by Max Blackwell

The photographs are of my last loco built which is of G.E. design and powered with a petrol engine. The unit is made 1" scale (5" track) length 76", height 20", width 12" and 300lbs weight.

The power plant is a Honda 50 electric start overhead valve step-through motor cycle engine which connects to a reversing box made of 1/2" plate and contains a set of tumbler gears from a lathe which ran in 90 gear oil. The output shaft connects to a lay shaft then an endless chain goes forward to another lay shaft. From each of these shafts are drop down chains which connect to the centre axle of the 6 wheel bogies. From the centre axle are 2 chains one forward and one back which gives all 6 axles drive.

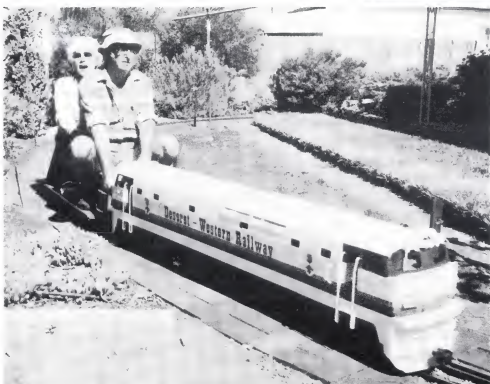
It is left in 2nd gear as this gives a smoother drive. My track is a figure '8' — 732 ft and 2% grade. The riding truck will accommodate four adults and has a ratio 1 : 4. The Honda is a 6V ac which is rectified to dc, a dc Amp and volt meter are fitted in the rear cab windows. Directly underneath is the control panel — a light shines through a hole to light this panel. All lights on each cab are operational, the front-end main light is a quartz halogen miner's lamp bulb (a very bright bulb). Thorn EM1 Halogen type 4V, 1 amp No.5 81903 (on box) lights under each

end of the chassis are very handy in case of a night-time derailment. The chassis is of rectangular tube construction 2" x 1 1/4" x 3/2". The fuel tank is from a lawn mower and lasts several hours. The body is of 1/16" mild steel, the cab inside drivers end houses some electrics, the front end rear wall is mesh, behind this is a fan but have not really needed it.

The pantograph electrics were turned from aluminium, a bit of guess work in places, no horns as yet. Paint work is automotive, main body colour Toyota, Cab ends Ford, striping 2 x Ford and 1 x Datsun, Lettering —



The completed loco resplendent in white with blue around the windows. The striping on the lower body is (from top) gold, orange and brown.



A contented builder takes his new GE loco for a run on his garden track

English, model paint. Main colours were masked and sprayed. Chassis flat black. The unit took approximately 18 months of spare time to complete having to design and fit all parts as I went along. Several hours of test runs, then dismantle the unit and prepare it for painting. Some time was spent preparing the steel for the first etch coat, filling and rubbing till the time came to match up which is very tedious with different colours. Many sprays later the loco was finished. I let the paint settle for 2 months then cut and polished it.

I would like to use a 6V solenoid to ring a bell under the chassis (the solenoid to operate a striker which hits the outside of the bell). I have some 24V solenoids. Someone may have a better idea. Will they work on 6V DC with less turns or is this not the case? They are out of photocopy machines.

Yarrow Boilers, Cardiff and Nostalgia

by Tom Burns

photos supplied by the author

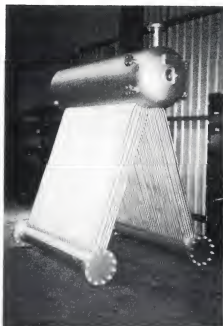
When I heard that interesting things were happening in Munibung Road, Cardiff, my interest was immediately aroused because, as a fifteen year old apprentice, I was employed at the nearby (now defunct) Cardiff Railway Workshops. I will never forget standing in awe at the imported casting of a C38 locomotive frame, as delivered, complete from buffer to drag beam with cylinders, horn cheeks, spreaders and even the compressed air receiver. Everything was machined in one beautiful casting, and I have never seen a better example of engineering excellence. Twenty six of these masterpieces have been cut up — four remain. (3801, 3813, 3820 and 3830, albeit 3813 is in pieces ... Ed)

But back to Munibung Road, Cardiff. Everyone knows that Cardiff is in Newcastle — Wrong! It is in the city of Lake Macquarie and the local pub is "The Iron Horse" and was very popular with the aforementioned apprentice! There is no better place to find steam alive and well than at McColl Manufacturing where boilermakers still know how to make boilers. They first surprised the knockers in 1987 when they built a wet-back single flue Scotch boiler, designed by the late Bill Evans for *William the Fourth*, a side paddle wheel steamboat. It drives a side lever beam engine designed by local boy, Ernest Winter. The "Willy Four" was a Hunter bi-centennial effort and can now be found most days near Queens Wharf, Newcastle.

The expertise and willingness to have a go by Bill Reid and Richard Tate have again come to the fore. They have completed and tested a Yarrow type boiler for the Sydney Maritime Museum, to fit the steam boat *Lady Hopetoun*. Yarrow boilers used to be, but are no longer used in our destroyers. In fact the last one I saw was in a 3½" loco that came to our track one day many years ago, driven very smartly by a teenager named Ross Forsyth!

Bill Reid explained some of the problems encountered in making old technology with modern methods. The top and two bottom headers were drilled to take the 396 water tubes, each 28.5mm diameter. The three headers were set up on a welding jig in their correct relative positions. This jig could be rotated about the boiler's longitudinal axis. The two small bottom headers were then split longitudinally to allow the tubes to be welded inside the bottom headers. Starting at one end, two tubes were welded to the top and bottom headers, then the boiler was rotated 180° and the same tubes welded on the other side. Two at a time, all tubes were welded in. This involved turning the boiler 198 times to allow each tube to be welded inside and out in the downhand position. The top header was just big enough to allow the smallest welder to slide inside to do his work, further proof that bigger is not better!

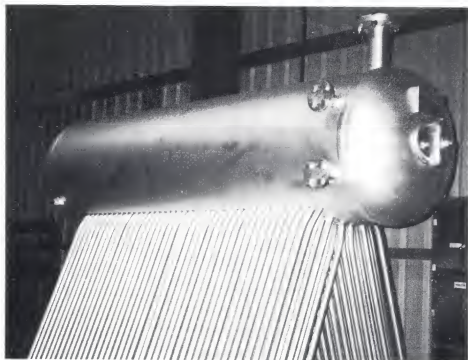
The next step was to submerge and weld the two split bottom headers back together,



(above and below) The Yarrow boiler as seen from both ends



weld on the bottom header flanges and top header end domes, fit flanges, plugs and washout covers. Next was a hydrostatic test to 2568kPa allowing a working pressure of 1724kPa. So when you see the *Lady Hopetoun* gliding around Sydney harbour, remember that steam technology is alive and available in Cardiff. (If you are still not impressed, consider this — Joe Huntley has lived in Cardiff all of his life!!)

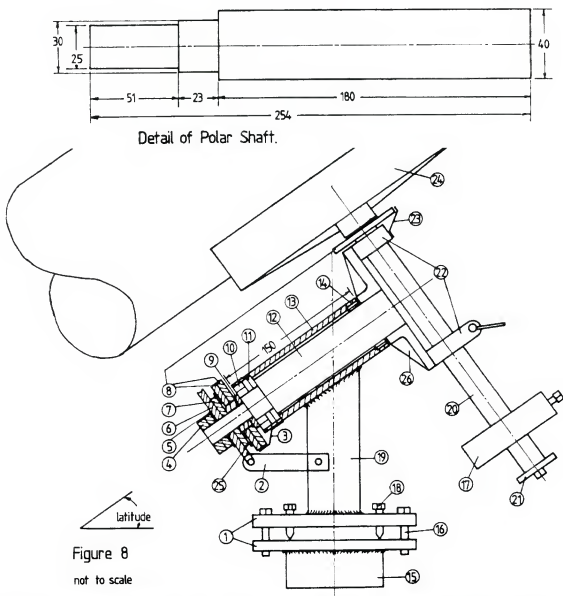


This side view shows more detail. Although the barrel is the same shape at both ends, details are considerably different.

Building an Astronomical Telescope

Appendix to part 5 — Item Table for Figure 8

An oversight in AME Issue 75, November-December 1997, on page 53 allowed figure 8 to be printed without the table to match the diagram. AME apologizes for any inconvenience. The table with figure 8 is reproduced below.



Item	Description	Size	Material	Item	Description	Size	Material
13	Polar shaft housing	50mm dia.	Gal water pipe	26	Declination shaft base fabrication		MS
12	Polar shaft		MS	25	Clutch pad washer with a 30mm hole	60 x 3	MS
11	Thrust race and plate	52 x 30 x 8		24	Telescope support cradle fabrication.		MS/timber
10	Ball race (plain)	55 x 30 x 12		23	Declination cursor		
9	Spacer RA discs		MS	22	Declination shaft bearings (1 with clamp)		
8	Discs RA/Dec	75 x 5mm (3)	Brass or Al	21	Counterweight retaining washer		MS
7	Worm wheel clutch pad		Ferodo or sim.	20	Declination shaft	25mm dia.	MS
6	Worm wheel	8mm thick	Brass or GM	19	Housing Pillar	50 x 25	MS
5	Worm wheel spacer	40 x 3mm	MS or GM	18	Mount lateral adjusting screws	3 x 10mm	MS
4	Locknuts	25mm dia.	MS	17	Telescope counterweight		
3	RA Cursor			16	Base securing studs	4 x 10mm	MS
2	Worm drive and support bracket		MS	15	BSP cap	80mm	MS
1	Pedestal top and mounting base		Mild Steel	14	Needle roller bearing	52 x 40 x 12	

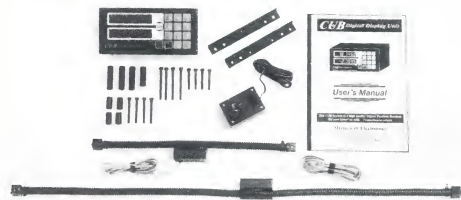
Product Reviews

The CUB Digital Position System

For many years "Digital Readout" (DRO) systems have been available for use with lathes and milling machines. The forerunner of computer numerical control (CNC) for machines, they still do an excellent job but generally amateur machinists / model engineers find them outside their price range.

The introduction of the 'CUB' Digital Po-

I chose to fit the 'Y' axis first as the knee casting was acceptable for flatness. I marked out, drilled and tapped M5 for the fixing screws (supplied). The datum used was the slideway surface on the knee. The angle piece in the kit was attached to the reader using the screws in the reader body and the locking bar removed. I then spotted up through the angle, drilled and tapped M5 and packed and shimmed as necessary to ensure that the



This is what comes in the box

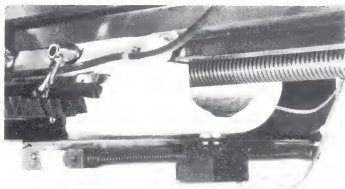
sition System puts a DRO within the model engineer's reach. The CUB system operates on a rack and pinion arrangement instead of a glass scale or a wire that unwinds.

The kit comes in a sturdy box and contains 2 spars (scales) with readers, 1 two-axis display unit, 2 packets of assorted capscrews, spacers, angle already drilled to suit anchoring to the reader, a mounting block for holding one end of the rack plus 2 cable ties, a plug in power unit and instruction manual. The rack has one anchor already fitted and pinned plus is held to the reader in correct position for the rack and pinion by a locking bar.

I fitted the equipment to a Bridgeport style milling machine, which discounting many interruptions, took approx 3 hours. A suitable protective cover strip (as recommended) taking about one hour extra.

reader moved over the anchored rack without any obvious sign of deflection. Another method would be to mount a suitable bar on the knee, clock it all up and then fasten the spar in previously drilled holes.

The 'X' axis was much easier to fit to the mill as the machined back face of the table allows for better and quicker marking out. This spar required cutting to length which was simply done with the hacksaw and cleaned up with a file.



The 'Y' axis scale as fitted to the milling machine table used in this review

The racks are enclosed in a corrugated flexible plastic conduit which is finally fixed to the second rack anchor by use of a cable tie. This should protect the rack and pinion from the ingress of swarf and suds. The plastic should be further protected by a sheetmetal angle piece approx 2" wide suitably anchored above the reader. (if you have got this far then this cover is no problem and even the real expensive ones need this protection.)

The display unit can be mounted on a suitable angle or bar from the lifting eye on the overarm. You can use a double jointed device or whatever. I used a piece of 50x25 RHS and 2" brass angle with suitable spaced holes to suit the two mounting screws in the back of the display unit. The whole thing swings back out of the way when not in use. The leads from the display unit were taped to the mounting arm and arranged so they were still "slack" at the extremity of travel on both X and Y axis.

With installation completed the tests began. The first sample one was to zero the display and zero both long and cross collars. Wind on one revolution and check the display. The difference on two occasions out of five both by myself and one of the "workshop interruptions", was 0.02mm. I then placed a piece of square brass in the vice, took a skim with a sharp cutter on both axis, zeroed the display on 'inch' scale, brought the cutter back to zero and passed same down the material on five occasions. Difference between first and final reading was 0.0002". A piece of aluminium square was placed in the vice and four 1/4" diameter holes on 2.5" centre were drilled and reamed in the bar. A second piece of aluminium was positioned in the vice the table was moved to another position approx 5" from the previous datum. The display was zeroed and another four holes drilled and reamed 1/4" diameter. Dowel pins were fitted to one piece and the second piece fitted onto the pins. On reversing the bars the fit was slightly tighter but was nothing that I would call detrimental to either commercial or hobby standards.

All in all, for the price, I consider the CUB a good buy.

The display can do the following functions:-

1. Inches to 0.0005"
2. Metric to 0.02mm
3. Diameter readout
4. Minus setting
5. Two independent datums (inc/abs)
6. Count direction is reversible

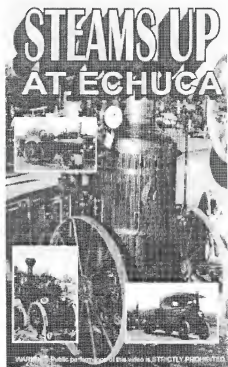
The only thing I can find lacking is in the screws supplied. 4 off M5 x 20 SHCS would be useful, and the supplier has assured me that these will now be included.

Price: \$1259 including sales tax

Available from: Microcraft Electronics, PO Box 514, Concord, NSW. 2137 Tel (02) 9744-5440 Fax (02) 9744-9280

Barry Glover

Steam's up at Echuca



"When the Echuca rally starts to fire the boilers, there's steam galore!" A new addition to the growing range of videos from the Gregory Williams studio. This film covers the annual Queen's Birthday weekend event at Echuca on the Victorian bank of the River Murray. The opening scenes are a montage of a Grand Parade and entice the viewer with ambulating steam road vehicles from the stables of Cowley, Buffalo Pitts, Ransom and Sentinel. These views are further enhanced with miniature traction engines, penny farthing bicycles, early cars, trucks and tractors. I've never been to the Echuca Rally, even though I have a great interest in all that it has to offer. I didn't realize how much alive and fun it is!

The quality of the video is very good both in picture and composition. I never became bored with the scenes unfolding before my eyes. It is amazing how much early agricultural equipment is still operational. Gregory has a "feel" for Australia's mechanical heritage and it shows! He covers the Traction engines and rollers, the biological tractors (Clydesdales and draught horses), some weird one lung tractors and the occasional glimpse of a Lantz Bulldog tractor. Other scenes include the miniature railway with its 5" and 7 1/4" g locomotives transporting their happy passengers. I was surprised to see a model maritime contingent at the rally, many models of tugs and other commercial vessels were operating on the water and on show on the land.

A fascinating scene showed a horse-drawn Shand Mason fire engine complete with polished brass work and "Keystone Kops" style crew attempting to extinguish a burning out-house.

A segment worth its weight in gold is about the rebarrelling of the Furphy Water

Tanker. Gregory shows what seems to be the whole demonstration that covered the assembly of the tank. The video shows the heating of the steel bands that attach the cast ends to the tank body. He also includes the commentary on the Furphy story and many anecdotes of this Australian icon. If you ever wanted to make a Furphy Tank model for your miniature steam traction project, this is an excellent resource on its construction technique.

The video includes interviews with owner/restorers of the equipment on show. This adds an element of being a lot closer to the heart of the machinery on show. While some people were a little uncomfortable with the interview, they still managed to get their message across.

As with most agricultural style of rallies, there was a grand parade. Gregory took the opportunity to film most of the exhibits as they rolled or were towed past. Some very finely restored vintage motor vehicles were captured on film for all to see.

My personal favourite was seeing the Foden C Type wagon in steam. I have a collection of castings for a 3" scale model of this grand machine. It almost made me run out to the workshop to make something else for my Foden, but I decided to wait and finish the video first!

I was astounded at the huge logs the Fowler road locomotive was hauling. A later shot had the traction engine hauling two trailers of three huge logs each! What a load!

The video includes plenty of close-ups so you can really see what's going on. The Carlton Brewery Clydesdales and Barrel wagon even get a close-up.

General farm machinery, early army vehicles and amphibians are included. Plenty of vintage tractors including one brand I've never heard of... Hart Parr.

For the model steam tractioner there is a beautiful half-size model of a Burrell steam tractor of 1898. Built by Ken Ainsworth and currently owned by John Cole. The prototype of this model was an experiment and never went into production. It disappeared early this century. On the model the engine is compound, the axles are sprung, it has chain drive to the rear wheels, just like the original, and Ackermann steering. The vertical boiler is based on the type used on the Merrywether Fire Engine. It has 215 psi for the compound engine and can easily supply steam for the 42 riders it is capable of hauling. The model is immaculately finished.

Well worth a look if you have steam in your veins like me!

Steam's up at Echuca

VHS, PAL, 60 minutes, Colour.

Available from: Gregory Williams Photography, 154 Orange Ave. Mildura, Vic. 3500

Price: \$39.95 including pack and post.

Brian Carter

Melbourne's Marvellous Trams



It's interesting to see what arouses responses from AME's readers. Quite unexpectedly, John Campbell's articles on his tram engine have prompted a lot of reader comments on trams. So we're venturing off the steam path to tell you about a just-published tram book that is selling very well.

The book is *Melbourne's Marvellous Trams* — a very readable, crisply written, beautifully illustrated, full-colour, 96-page book whose two authors are acknowledged experts on Melbourne's tramways. It will delight "tram-heads", but will also appeal strongly to a much wider audience, including those from Melbourne or who like to read about electric technology in a historical and social setting. I have only a mild interest in the subject, but I found the book fascinating.

The content of *Melbourne's Marvellous Trams* is mainly 200 well-chosen, well-captioned photographs, livened by brief text to introduce the book's themes and by several GAs and maps. Coverage is comprehensive, including cable trams, old and recent tram series, trams painted in special colour schemes — including "artworks", advertising and restaurant cars — trams in the city, trams in the suburbs, trams in flood and other mishaps.

In addition, there is a bright introduction by Melbourne journalist Keith Dunstan; an item on "why Melbourne kept its trams"; and text of a very interesting speech in 1955 by Major-General Sir Robert Risson, Chairman of the Melbourne and Metropolitan Tramways Board — the man who relentlessly concurred in his tramway system while lesser contemporaries in the other states gave in to well-organized motor car and bus lobbies.

If you are a serious student of Melbourne trams, you will probably save your highest praise for the accuracy of the text. The authors are excellent writers, know their stuff, and are careful of the facts — something that many Australian transport history/technology writers need to emulate.

Melbourne's Marvellous Trams

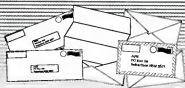
By Dale Budd and Randall Wilson. Published by UNSW Press, Randwick, 1998. ISBN 0 86840 504 3.

Price: \$29.95 (plus \$6 post. & handling)

Available from: The Railfan Shop, 40 Market Street, Melbourne, Vic 3000 Ph. (03) 9621 2238, and other bookshops

Clive Huggan.

Letter Box



Klug valve gear

Sir,

In his article *Where's the Rest of It* (AME Jan-Feb 1998), Geoff Murdoch questions the description of the valve gear used by Orenstein & Koppel as Marshall valve gear and prefers to call it Klug gear — a rose by any other name.... He quotes his authority as the *Model Engineer & Amateur Electrician* of

indistinguishable geometrically from that which Geoff uses to illustrate his article. Apart from the locomotive version being horizontal and the marine version vertical, the only difference is the use of a return crank by O & K in place of an eccentric.

I enclose a copy of the diagrams of Marshall and Bremme valve gears, taken from my copy of the seventeenth edition of *Verbal Notes & Sketches for Marine Engineer Officers* by J W M Sothorn.

Jon Milne-Fowler
Western Australia

Blowfly Rally

Sir,

Recently Mr John Oliver, then Secretary of Mudgee Miniature Railway Co-op Limited, contacted a member of Illawarra Live Steamers and explained that due to the decline of active members within the Mudgee Club, the members remaining were not in a position to hold the Blowfly Rally in August 1998 and asked if ILS was in a position to stage the Rally

At a General Meeting of ILS members, it was unanimously agreed for ILS to undertake the staging of this most prestigious Rally.

During a discussion with President Colin Limb of Mudgee Club, it was agreed for the ILS to stage the 1998

Blowfly Rally, to uphold the tradition of the Blowfly Rally thereby meeting the high criteria set by Mudgee in hosting this popular event.

It was further agreed that ILS will act as Caretaker and when Mudgee again wishes to stage the Blowfly Rally, then ILS will only be so happy and willing to return the Rally to its birthplace. However, should another club show interest in staging the Blowfly Rally then ILS agrees to transfer the Rally to that club without demur.

It is proposed to hold the Blowfly Rally at our club grounds on 8 and 9 August, 1998. An advertisement will appear in AME and a 'flyer' will be forwarded to clubs in Queensland, NSW, Victoria and South Australia.

Ross Edmondson

President, Illawarra Live Steamers.

More variety needed

Sir,

I have been a keen model maker for many years and enjoy the Australian Model Engineering publication for ideas and general interest.

However, due to the isolation from any club, it is difficult to be involved with live steam. Most of my projects are farm machinery or IC engines, so a few articles now and then along these lines would be of great interest. I know of other modellers who are not near to a club for support and assistance, and I think they would appreciate such articles. I do acknowledge that we are few and most of your readers would be into steam, so I guess they hold a priority and need to be catered for.

Great magazine all the same, with good articles and photos. Keep up the excellent work — it is appreciated.

Ralph Uppill,
South Australia.

(AME is a relatively small, voluntary effort and we do not write the articles. We rely solely on what our readers send us to publish. If some of you would like to see different types of articles, send something in. It does not need to be expertly written — we can knock most things into shape and we also love variety! If you have some ideas for an article and are not sure how to go about it, give me a call or drop a line and I will do what I can to make it easier for you... Ed)

Ni-Cad battery charger

Sir,

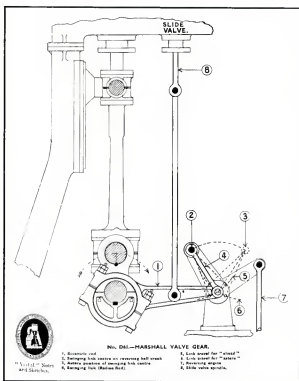
Congrats on top publication and ten years service.

I read my article on battery chargers (Nov-Dec issue), and due to some foul-up in otherwise excellent art work, the schematic for a current regulated 'ni-cad' charger could not work as shown. I'll try to describe the circuit in text alone, in hope of saving 'art-work' time and possible disappointment for 'non-electrical' constructors.

To build current regulated 'ni-cad' charger on "Gel Cell" board (pages 25-26)

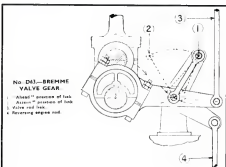
Cut and scratch board exactly as shown. Scratch additional vertical division on Land 'C', mm from right hand side of board. This will now give two Lands at 'C', where only one existed before. Call the left one 'C' and the right one 'E'.

Bolt on 7805 and solder pin 1 to land 'A', pin 2 to 'B' and pin 3 to 'C'. Solder 'C1' (if needed) from 'A' to 'D'. Observe correct polarity for 'C1'. Solder 'C2' from 'B' to 'D'. Correct polarity. Connect any normal red LED from 'C' to 'E', with its anode to 'C'. The anode is the longest wire. Both LED wires should be cut and sleeved to mount neatly on board. Solder in 'R2' which is the LED ballast, and is always 220 Ohms, half Watt. From 'E' to 'B'. Solder 'R1', the current setting resistor, from 'B' to 'C'. This re-



November 1, 1901. It would be interesting to trace the origin of the ME reference.

However, to generations of marine engineers, trained in the British tradition, the "bible" was Sothorn's *Verbal Notes & Sketches*; the diagram of Marshall valve gear therein is



sistor will govern how much current, over and above the 16 ma already passing through the circuit, goes into battery being charged.

The board is now complete. Land 'A' connects to 17 Volts negative. The positive wire to battery on charge comes from Land 'B', NOT 'C' as in *Gel Charger*. Negative to battery comes from Land 'D', as in *Gel Charger*.

The commonest charger used in our club is for 'AA' cells rated from 500 to 700 ma. For this the value of 'R1' is 110 Ohms, giving 60 ma total constant current. This current stays the same for any number of cells, from one to eight in series.

As in any charging system, correct polarity of input supply, and battery being charged is essential. We try to avoid possible error by grouping our Ni-cads in packs of four, five or eight, as required, and fitting polarised plugs — in our case, cheap RCA audio plugs.

Bill Carter,
New South Wales

Hot air engine fans

Sir,

As an enthusiast of model engineering and Stirling Cycle Engines, I am always excited when I read and learn something new about them, as I'm sure some of your readers are.

Stirling Cycle Engines were used to power many types of early devices — like water pumps, dental drills, and so on. In fact, there was a time when hot air could really cool you off. In the gas lamp era, before electricity became widespread, hot air engines were applied to fans. Many enthusiasts are familiar with, for example, Dr James R. Sennits' model version. *Moriya*. However, an array of companies built hot air engine fans commercially, the Lake Breeze, just to name one. Many of these fans were similar to present day electric fans in that they were portable, designed for individual use. They can occasionally be spotted in older (or very authentic) motion pictures. Ceiling fans were also built, often belt driven from a fairly sizeable hot air engine.

As electrification spread across the world, electric motors took over the task of keeping things cool and the manufacturing of hot air engine fans ceased. OR DID IT?

You see, electricity hasn't gotten everywhere quite yet, and as a result, Hot Air Engine Fans were still being commercially manufactured in Pakistan until as recently as five years ago. This fan is a modern version of the original KYKO brand hot air fan sold in England and around the British empire for around 90 years.

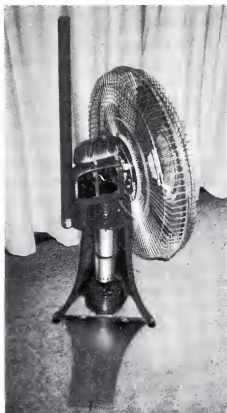
From the front, it looks almost like any modern day electric fan. But from the back the Hot Air Engine shows clearly in the shape of the housing. Not to mention the tall exhaust chimney, intended to get the heat from the burner up and out of the air stream.

Here are some specifications:

Weight: 10kg
Bore: inches

Stroke: 1.5 inch
Speed: 450 rpm tops
Power Source: Double wick kerosene lamp
Running time: 36 hours 1 litre
40 inch to top of chimney
34 inch to top of guard
4 blade fan in a 24 inch dia guard
Cast iron engine with ball-bearing crankshaft
2 cylinder 1 power piston 1 displacer cyl.

After a great deal of research, I have at last found the address of the manufacturer in Pakistan. I've been in extensive contact with the engineer who is very knowledgeable. He in-



forms me that he is no longer commercially manufacturing these fans, though he is prepared to set up his tooling to do so once only production. I hope to obtain several units for myself and a number for friends and enthusiasts who have already expressed interest.

For this to become a reality, all we need now is only a small number of enthusiasts to express their interest in obtaining one so we can make up the numbers to place the minimum order required by the engineer. I feel these fans are good value and should become quite collectible.

So here's an opportunity if you have ever been interested in obtaining one of these amazing pieces of machinery for your own, and don't want to be left wondering and regretting. Please express your interest by contacting me as soon as possible.

Andy Eisemann
39 Macquarie St,
Moana, SA 5169, Australia.
Ph/Fax: (08) 8327 3039.

Notes on Ball Valve Seats

Sir,

I read with great interest the short article "Notes on Ball Valve Seats" which appears on page 22 of issue 76, and I would like to add some constructive comments:-

1. I draw your attention to the fact that the formulae did not print correctly. It seems they were printed direct from a computer file where 'pi' and the 'square' indices were not transformed to the normal forms. Also, the Main Bore for a 3/8" ball will be 0.460 and not 0.460 as shown.

2. There is one other important factor that should be considered if Peter's logic is to be followed. If the water passage is to be set on the basis of the cross sectional area of the ideal seat, then there will also be a minimal amount of ball lift (y) required to fulfil this requirement ie, as the ball lifts off its seat the area through which water will flow will gradually increase. This area can be defined as an area equal to the circumference of the seat times the lift ($\pi \times d \times y$). If this area is to equal the cross sectional area of the set ($\pi \times D^2$ squared over 4), then the minimum lift (y) will be $(0.177 \times db)$. Using this formula the minimum ball lift for the series of balls given in the article will be 0.033, 0.044, 0.055, 0.066 inches and 0.88, 1.06, 1.42, 1.59 and 1.77 mm respectively.

3. It is good to ensure as free a flow passage as possible through the pump system, and whilst there is no concern with the data given, it should be noted that the pipe internal diameter may well be less than the minimal seat dimension (ds) in some cases. In my own engine the pipework is 5/32" with a bore of 0.1, smaller than the calculated seat of 0.11.

4. With regard to the "single sharp tap" method of forming a seat, I have found this rather a 'hit and miss' approach. May I suggest it is more reliable to arrange to 'press' the ball into the seat using light pressure from a machine vice.

Peter will be pleased to note that I have used his data as the basis for remodelling my own pump.

J W Gibson
New South Wales

(Peter Dawes' has replied to Mr Gibson's letter but because of the depth of detail and issues raised, it appears as a separate article on page 49. As for the formulae — see *Newsdesk* ... Ed)

Well Known Model Engineer Passes

Sir,

It is with sad regret the North West Modelling Society report the passing of our past President Mr Leslie Fredrick Richards on 14th December 1997.

Les and his wife Shirley were well known to many mainland societies and club members. Mainly S.L.S.V. Moorabbin where they were members for many years, and especially

Puffing Billy Society where both were early Gold Pass Certificate holders.

Les and his family arrived in Ulverstone, Tasmania 1988 from Melbourne they immediately joined N.W.M.E.S. Les displayed inspiration and leadership during his long term as our President.

Club members express sympathy to Shirley, daughter Linda and son in law Ray Anderson.

Miles Ponsonby
Tasmania

Infinite Earthquake

Sir,

The A.M.F.F., the first association to promote the passion for *live steamers* in Italy, is today faced with a most serious problem: the *earthquake*.

We are still alive, thank God, but we all have a home and a place of work which has been damaged. We had begun the construction of our beautiful 7/4" track along the mountain but now our office in Valtolina is very badly damaged and so for the moment it is closed. The 5" track and gauge 1 has also been badly cracked and only the wooden station is free, but it is not big enough to contain us and our trains. The locomotives and carrying cars were not badly damaged when they fell off the rails.

In this chaos we are *determined* to rebuild the tracks and to continue the construction of the new 7/4".

We had fixed the opening date of the beautiful show which was going to celebrate the inauguration of the new track as September 2000, but today this seems like a far off dream. *all this can be achieved* however with a little of your *moral support*.

Send letter or fax of solidarity to the association asking the *mayor of valtopina* (Mr. Giancarlo Picchiarelli) and the *president of the Umbrian Regional Council* (Mr. Bruno Braecaleute) to *not underestimate* the importance of the construction of the *first mini steam railway* in Italy could have for the valley as a tourist attraction, and to therefore help our association with this project.

If you would like to help us in a more substantial way you can make a donation directly to:

Dr Guido Mattoli
President of A.M.F.F.
Via Roncalli, 11
06034 Foligno ITALY

Or with a money transfer (also by credit card) to the *Banca Popolare Di Spoleto* - Foligno branch. Code ABI 5734 and CAB 21700

Current account number 18104 made out to Guido Mattoli

Description of payment: PRO VALTOPINA LIVE STEAMERS

A memorial tablet inscribed with the names of all the people who have helped us

will be unveiled at the inauguration of the new track.

Thank you all, from the bottom of our hearts.

Guido Mattoli
President

Associazione Modellisti Foligno Città
'Ferroviaria

Townsville Train Park almost washed away

Sir,

Many AALS Members will hold fond memories of the Convention they attended at Townsville at Easter 1995. On the weekend of January 10th the rain came down in such amounts, that our Train Park was almost washed away. Russell and I paddled down to the Park on Sunday morning through water over our knees for about four kilometres, to get to the Train Park. When we eventually got to the Park it was completely covered with water. The Station still had 600mm of water inside, both the fridge, freezer, sound system, canteen supplies and all our Club records were under water. The water had been over a meter deep around the Station, as shown by the water mark left on the outside wall and up to the top of the Picket fences. Needless to say all the Riding Carriages were under water. Since the Convention the Club members have built a Tunnel at the back of the Park, where the line leaves the creek bank to run across the park. We had four brand new carriages which had just been painted and lined but not yet in service. They went under 350 mm of water but thankfully all the Club and members carriages were ok after they had been washed down and scrubbed clean. The only engine that went under water was the 5 inch DH.

We had just two weeks before Public running day on the 25th to clean all the mess up, but needless to say the members had the Park in running order except for the Canteen, which still needed more scrubbing up. However, as with all good Troopers, the show must go on.

David A Edmunds
Queensland

The Centaur saga

Sir,

Like Peter Wilson of Queensland (Letterbox July-August 1997), we have built a Centaur and, like Peter, have had serious troubles with vibration! The completed model was bolted to a wooden base measuring 1" x 8" x 16" that was clamped to a heavy bench. Considerable difficulty was experienced in turning the engine due to the high compression and it was not until a powerful electric drill, fitted with an appropriate attachment was used, that starting was achieved. The result was most dramatic, a burst of amazing speed and the most violent vibration, engine, battery and bench literally dancing until the ignition was switched off. Getting the engine to start was difficult, to run slowly impossible!

After several months of experimenting with considerable advice and help from an expert with small engines it was suggested to replace the carburettor with one of more conventional design and to reduce the compression ratio by fitting a quarter inch thick spacer between the cylinder and frame. A non return valve and sight glass to monitor petrol feed were also fitted. When the new carburettor was primed by pressuring the fuel tank starting was immediate but both speed and vibrations were uncontrolled. The engine was belted to a generator in the hope that under load some control might be achieved. The test runs lasted just long enough to read the meters, 10-12 amps at 15-16 volts, by which time vibration was chaotic, the 6" G clamps had become loose, the large 12 volt car battery was dancing across the bench while cooling water was showering everyone around. When the battery reached the end of its lead contact was broken and silence fell. Variations in ignition timing or valve events did not affect these problems. In spite of fundamental changes to the design of the carburettor the engine could not be made to run slowly and vibration was uncontrollable. However, with the reduction in compression starting was easier.

With some steam exhibits the engine was taken to a local rally and one the first start of the day it fired, speed increased and then the *fly wheel fell off!* A fractured crank shaft showing, according to the experts, a typical stress fracture.

During repairs the static balance was checked by weighing the various components when it appeared that vibration might be lessened by removing one of the two counter weights. This was done and a slight improvement noted.

The engine has been painted, lined and with a cooling tank and silencer makes a handsome model but for the time being was relegated to the top shelf.

Recently another I.C. model has been completed with a barrel type of carburetor that gave very good speed control which aroused thoughts of the Centaur. After making an adaptor the carburetor was transferred and starting arrangements commenced. An initial tick over speed of some 500 rpm was achieved but vibration was excessive, as speed was increased to 700-800 rpm the vibration almost disappeared. Further increases saw vibration return until the 1300-1400 range when again it became acceptable. Speeds above 1500 were not tried as vibration was becoming excessive. Speeds were measured with a hand held Jaquet tachometer. A fourth carburetor is now being made!

The opinions gathered over the years are that the design of this engine is flawed in that it is unbalanced and that the mass of the single flywheel is not sufficient to maintain a steady speed at low revs.

H.F. Atkinson
Victoria

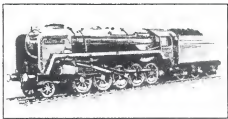
Three cylinder 2-10-0s

Sir,

The nationalised British Railways designed their standard steam locomotives classes for 'stop gap' reasons and not 'competitive' reasons. The 'gap' was prior to and during dieselisation and electrification.

If the standard classes had been designed for 'competitive' reasons, what would have been produced? The preserved 8P, No 71000, three cylinder, Caprotti poppet valve, 4-6-2, *Duke of Gloucester*, is perhaps an example of this.

A hypothetical example is illustrated at p48 of *Railway World* January 1994 in an article by Gil Hughes called *All Those Wheels*. This is a 10F, No 95004, three cylinder, Caprotti poppet valve, 2-10-0, *Asteroid*, based on the 10F 3/2-10-0, two cylinder, piston valve, 2-10-0, class. There are also options given for condensing and gas firing.



The illustration of No 95004 (above) was created by Gil Hughes and is reproduced by permission of *Railway World*.

In Vol 4 and Vol 5 (1980-81) of *The Duke* (Journal of the Duke of Gloucester Restoration Society) are illustrated two live steam models of No 71000. These were built by Dennis Evans of Liverpool, England, in 7.25 inch gauge and 3.5 inch gauge. Each model has working Caprotti poppet valve gear.

It is obvious that poppet valves can be built in a small scale steam locomotive so perhaps the hypothetical 10F 3/2-10-0 can offer a challenge to modellers to build a British Railways standard steam locomotive the way it should have been built. Perhaps it could be named 'Morning Star'.

A hypothetical Australian version, 'Southern Cross', would be interesting with the addition of a decent sized bogie tender. The hypothetical 10F prototype has an estimated 59,500 lb (coal fired) and 66,640 lb (gas fired) tractive effort which would have been useful in Australian conditions.

David Burke mentions at p260 of *Man of Steam* Iron Horse Press NSW 1986 an E E Lucy 2-10-0 'paper locomotive' which may have been one of the various proposals to rebuild the D57 class. A E Durrant also discussed a hypothetical 3/2-10-0 at pp30-31 of *Australian Steam* Reed Sydney 1978. He wrote that a 3/2-10-0 variant of the NSWGR D57 class would produce at least 25% greater tractive effort.

The 2-10-0 wheel arrangement has at least a 'paper' history in Australia and should prove to be a worthwhile 'pipe dream' project.

Several plans in various gauges are available ['Curly' Lawrence/Martin Evans (*Model Engineer* Magazine) version and a 7.25 inch gauge Jim Vass (*Miniature Locomotives UK*) version] of the British Railways 9F 2/2-10-0 and perhaps these could be modified to represent the hypothetical 10F 3/2-10-0 or represent an equivalent Australian version. An immediate concern would be altering the smokebox profile to accept the inside cylinder, similar to the D57 and D58 classes.

'Curly' Lawrence said that he designed out the errors of the prototype in his models so the hypothetical 10F 3/2-10-0 may be a good project to do likewise.

James Tennant

Canberra

(Letterbox continued on page 51) ...

Letterbox Contributions

You are welcome to send letters by mail to: PO Box 21, Higgins, ACT, 2615 or fax to: (02) 6254 1641 or e-mail to: ame@dynamite.com.au

As far as possible, AME is an open forum for all members of our hobby. Therefore, all expressions of fact or opinion — as long as they are not libellous — will be considered for publication.

Please type or clearly print your letters, as script is often difficult for the typist to interpret.

The Letterbox is a popular medium of expression, so space is limited. Therefore, letters of 400 words or less will have a better chance of being published.

GELSA Steam Locomotives for Brazil

Sir,

At p28 of A.M.E. Issue 56 for September-October 1994, there is an illustration of a GELSA 4-8-4. Mentioned in the article on Andre Chapelon is that the GELSA consortium had also produced a 2-8-4. Illustrated below is an outline of the GELSA 2-8-4. This illustration was not included in the above article. It is included here for completeness.

Below is a comparison table of both prototypes.

Table 1: Comparison of GELSA 2/2-8-4 and GELSA 2/4-8-4

Items	2-8-4	4-8-4
Grate area sq. m	4.00	5.33
Firebox sq. m	19.70	27.60
Tubes sq. m	102.54	140.20
Superheater sq. m	45.00	68.00
Boiler press.sq. cm	15.00	20.00
Cylinders (x2) m	0.43x0.54	0.43x0.64
Driving wheel diameter m	1.27	1.50
Carrying wheel diameter m	0.74	0.74
Adhesive weight tonnes	40.00	52.00
Engine weight tonnes	69.00	91.00

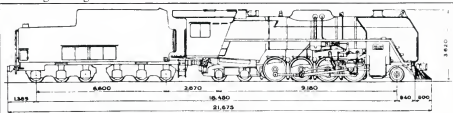


Table 2: Construction data

Running numbers	Constructor	Construction numbers	Construction date
2-8-4			
141.1-22	Fives-Lille	5235-5256	1951-1952
142.23-25	Cail	4473-4475	1951-1952
142.26-47	Schneider	4938-4959	1951-1952
142.48-66	Cail	4476-4494	1951-1952
4-8-4			
242.1-24	Batignolles	870-893	1951-1952

These locomotives were the only new steam locomotives that Andre Chapelon was involved with. The locomotives incorporated his design principles such as KylChap exhaust systems and internal streamlining. So far little has been recorded about these locomotives and the last working examples were in Bolivia in 1976.

References:

- 1 Maurice Maillet (1981) *L'Oeuvre....* Les Edition du Cabri France pp 123-130
 - 2 Col. H. Rogers (1972) *Chapelon Genius of French Steam* Ian Allan UK pp 117-120
 - 3 *Locomotives Internationales* No 17 p35, No 34 pp 16-17
- James Tennant
Canberra

Ball Valve Seats Revisited

by Peter Dawes

drawing for publication by Neil Graham

Mr Gibson's letter (see *Letterbox*) about "lift" in ball valves stirred up a hornets' nest. A colleague recalled a series of letters on the subject in M.E. over ten years ago. I looked the subject up in Henri Larose's index and found eleven references in Postbag in eight issues during the 1980s. Another colleague then was able to extract the required issues from his M.E. library. Readers are recommended to read these if they can get hold of them. They are educational. But some readers may be unable to get copies so I'll try and bring out the salient points.

The list of references includes just issue number and year because it would take too much space to list authors, dates and pages. Writers include such eminent contributors as Tubal Cain (TC) and Geo H Thomas (GT): 3545/'76; 3572/'77; 3712/'83; 3716/'83; 3721/'83; 3727/'84; 3733/'84; 3863/'89. But as well as those in ME there is a good one by Ross Bishop Wear in our own AME back in Jan/Feb '91, Issue 34. It concentrates on safety valves.

A third bottleneck

As Mr Gibson points out, there is a third bottleneck in the passage through a ball valve — that is the passage between the edge of the seat and the surface of the ball once the ball lifts. I'll call it the "throat". This passage can be quite variable depending on the way the ball is lifted, how far up it goes, on the nature of the fluid, etc. If it is a safety valve, the ball is lifted by steam pressure but what happens then depends on the spring characteristic. A high spring "rate" (short and stiff) will allow only a short lift so the result is throttling of the flow. Then it doesn't matter much what the calculated lift *should* be, the spring determines the lift.

On the other hand if there is no spring or if it is a slow rate spring (long and soft) it will compress a long way before its resistance becomes too high for the pressure to hold it up. It will push the ball up as far as the physical design of the valve body will allow.

Now that can be bad in a pump with a pulsatic output because the ball takes too long to move up and down, and pumping becomes inefficient. On the other hand if it doesn't lift far enough the throat is restricted and the pump has to work harder.

Either type may oscillate creating a juddering or pop or flutter characteristic, as writers point out. That is more prone to happen when the lift is either too high or severely restricted.

Other properties

Another parameter is the nature of the fluid. A compressible fluid (steam or air) will have a very complex action. An incompressible

fluid such as water or oil will be somewhat easier to study. This is why you cannot test a safety valve properly unless you use its correct medium, namely steam.

Another property is whether the flow is affected by the Bernoulli effect as it passes around the ball (GT claims to have been taught hydraulics by the great Bernoulli himself, so he should know).

A third property is turbulence around sharp edges and this is going to be both viscosity and velocity dependent. Viscosity in turn will depend on temperature. I expect hydraulic engineers could theorise until the cows come home about all those. I'm certainly not going to.

The correspondence gets heated at one stage. Some of it was the result of people not reading the original letters carefully and then jumping to unwarranted conclusions. Long delays in the turnaround of the letters between issues compounded the problems.

Mr Gibson describes forming the facet by squeezing a ball on the seat in a vise and I like that idea. Yet surprisingly, it was criticised by one correspondent (Geo Hill). Tapping the ball was criticised by Hill and by others (Eric Rowbottom). "Burnishing" the seat facet using a rotating steel ball pressed into the seat was recommended by Hill.

Lift

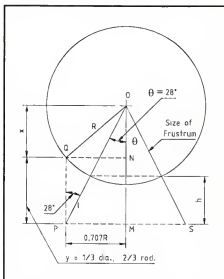
Micrometer adjustable lift was described by D McRobbie who used a 40 tpi screw held with locknut to fine tune the lift. C.S. Purinton of USA (readers will recognise him as a contributor to "Live Steam") pointed out that valves for reciprocating pumps should be given the minimum lift necessary for free pumping, or efficiency suffers due to excessive back-leakage. He offered a five point recommendation.

Professor W B Hall wrote about safety valves and lift, giving practical figures. Safety valves are a subject on their own and some aspects are now almost defined legally rather than logically. Safety valve design has a strong traditional element descended from full size practice, so builders wanting to experiment should be sure to get their boiler inspector's approval before mucking about with the design. I can assure them however that the "707 rule" will always apply. One thing I would be very loath to advise is the use of compressible seats or balls in safety valves.

Frustum

So apropos Mr Gibson's formula for lift. I certainly think it is desirable to set a minimum travel, although as the ME correspondents showed, there can also be too much. I should point out that the formula that he has used is

that of the surface area of a short cylinder and while that is correct for a flat bottomed valve, strictly speaking it is not correct for a ball or conical valve where the required area is that of the curved surface of a *frustum* of a cone (a frustum is the bottom piece of a cone after the top is lopped off square to the axis, or as it is sometimes called, a truncated cone). That frustum is shown in the accompanying diagram. It's produced by the circle of revolution



of the line joining the corner of the seat to the nearest point of the ball, and when extended, that line also passes through the centre of the ball. This line is where the point of *minimum* cross-sectional area occurs in the throat with a ball or conical valve. TC and GT both recognised this divergence from a cylinder but it was GT who recognised it as a frustum. Neither offered a formula to calculate it. TC said his "resident mathematician was away at the time revising her A levels!" I'm not surprised no one volunteered the formula. It is a very difficult calculation. What's needed first is a formula for finding the length of the sloping side of the frustum in terms of the lift and the radius of the ball. Then we need a formula for the area of the rim of the frustum given the diameter of the base and length and angle of the sloping side. I have found the formulae but they give an answer that looks wrong so I'll hold it back for the moment. With the formulae I equate the area of the frustum to the area of the seat and I can then quickly and easily solve the equation by iterating it in the computer.

When the ball is in contact with its seat the angle of the cone is a right angle (assuming the seat is made to the 707 rule) but the angle changes with the lift, getting smaller as lift increases. So the problem is that we can't cal-

culate the lift until we know the angle and we can't calculate the angle until we know the lift! However it is somewhat academic.

I suspect Mr Gibson's formula using just the area of the cylinder is a fair approximation, and it does have the merit of simplicity, but we must realise that it definitely errs on the low side for the figure for the lift. In the literature there seemed to be general agreement for making the lift somewhere between .25 and .45 times the ball diameter. Mr Gibson's approach based on a cylinder gives .25 times the ball (ie .177 times the seat).

The error will tend to be swamped by those other effects I mentioned above so the final answer is very likely to end up as empirical anyway. The correspondents do make that point. TC says that the abstruse calculation may still only serve as a guide. "You will have to suck it and see", he says.

So there you are. Readers making ball valves should consult those references but meantime I suggest using a figure of $\frac{1}{2}$ the ball diameter, partly to adjust for the approximation error inherent in using the cylinder formula, and partly to add a margin of safety for any other factors. It seems that we should not allow the lift to be more than necessary and in some applications it may actually be better to reduce it below the theoretical value. How do you know? Well you don't. The experts will say you just have to try it.

Seat diameter

I want to stress that you don't want to play around with the seat diameter. There is nothing

empirical about $0.707 \times D_b$ (the "707 rule").

One correspondent's trouble was clearly related to having too small a seat ($\frac{1}{8}$ " for the ball ($\frac{3}{16}$ "). It should have been .133". No wonder the ball was spinning on the seat!

If the seat is too big the ball falls too far into the hole. It may even wedge itself into the facet. For a safety valve that would be utterly catastrophic. For a water pump valve it might not matter too much as the hydrostatic pressure of the water should blow it out again, yet from one writer's experience even that doesn't necessarily happen. One complained of actually bending the pump handle because of a stuck valve. While that sort of thing should never happen if the seat is .707 times the ball diameter, if you use a corrodable ball and it freezes into the seat then anything is possible.

One writer (P Gardner) suggested using a PTFE seat insert to stop sticking, but I wonder if he was using the correct seat diameter in the first place? Bathurst colleague Gordon Batt recommends using an O-ring as a seat. It's not easy to calculate the geometry or to make it, but he says it never leaks and I'm sure he's right. Another builder uses rubber balls on rigid seats instead of rigid balls on rigid seats.

I stress the need to clean the valve and ball scrupulously before forming the seat facet by whatever method you choose, or you could end up with a defect in the facet. Even a minute piece of foreign matter can ruin a valve seat facet at the forming stage of proceedings. It will then require machining the face of the

seat deeper, because hitting the ball hard to try and "press" defects out rarely works. You are likely to damage the body of the valve long before you can squeeze out the defect.

Chatter

Apart from eccentric seat bores, the worst fault you can have in the bore is chatter marks on the inside caused by the reaming or drilling. These give rise to nicks in the edge of the facet and they will produce intractable leakage. And because the ridges are longitudinal no amount of re-seating can eliminate them. So it is important to ream/drill very slowly with accurately aligned support for the reamer/drill to eliminate chatter. It also makes sense to start the seat bore at the low end of the allowed range of diameters so that if it ends up with flaws you still have a chance to try again with a larger size before reaching the upper limit.

Two lessons emerge from this entertaining interlude. First is the importance of reviewing past history. The second is for correspondents to carefully re-read the original letter before jumping into print with a reply and getting the bull by the horns as Mr Macdonald did back in the eighties.

We need the formulae to close the book on this thorny issue and as far as I can discover, that has never been done. I will report again if the formulae turn up triumphs.

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AME May-June 1998

News Desk



compiled by David Proctor

Judging by the feedback, many of you were confused by the formula error in Peter Dawes' Ball Valve Seat article in the January-February issue. The error came about because my computer could not read the text characters in Peter's article, and I missed it when proof-reading. The one which came out looking something like "u2o2" was meant to read *square root of two divided by two* and the second one was meant to read *square root of ds squared plus db squared*. Sorry about that!

In *Steam Chest* (Sept-Oct 1997 issue), we published a drawing of a Hatham Davey pumping engine at Charters Towers. It was drawn by Peter Lukey of Babinda, who was not credited for it at the time. Apologies for the omission, Peter. This is probably a good time to remind contributors, if material is not their own, they must acknowledge the originator and get permission from the copyright holder before submitting it for publication.

How low can one get?

In the last issue we published a photo of Charlie Mead driving his steam tram. You would have seen from the last few lines of the article that I had been advised, after the magazine went to print, of his passing. Changes to the text were arranged over the phone as that page had not yet been filmed. What I was unable to include then, which I found very disturbing, was that shortly after Charlie's death, his workshop was burgled. The selection of items stolen indicate quite clearly that the thief was a model engineer and that he knew what he wanted. It is a sad state of affairs when a grieving widow has this additional trauma thrown at her by one who it would seem, is a participant in our hobby.

Mail service

Letterbox in the Nov-Dec issue included letters from D Cleburne of New South Wales and Douglas Hall from Queensland. Could you gentlemen please contact the AME office as we have mail for you.

From the Treasurer

If you have paid money to AME by credit card and it seems to be taking a long time to come through on your statement, *don't panic!* Because we are a small operation, in an effort to keep costs down, and the quality of the magazine up, we don't always bank on a daily basis. If it seems to take a couple of months before you are billed by your credit card company, it does not mean you have missed out.

In any case, check with AME before you contact your credit card company, because, as a matter of course, they stop all payments, and then we are back where we started.

Char

Despite the stories going around, char is still, and will continue to be in production. If its char you want, Barrie Jacket and the team at **Australian Char**, PO Box 1089, Narre Warren, Vic. 3805 are only too happy to help.

The reference to char in the last Newsdesk was the result of five reports to me in one week, one from a usually reliable person. Makes you wonder about the rumours that get around this hobby, and the motives behind their starting in the first place. If there has been any inconvenience to the people at Australian Char, my apologies.

Metrics

Now that AME has passed the ten year mark, it is probably timely to take a look at the issue of measurements — metric versus imperial. The diminishing availability of materials in imperial sizes plus the fact that anyone under forty years old was taught metrics at school, would indicate a greater emphasis on metrics would be appropriate. To test the water, AME will shortly be running a construction series which will be totally metric.

Towboats

What is a towboat? you ask. AME has received a letter from a William Zumwalt in the US on this very subject. He says (quote)

"I would like to inform you that there are several sources for plans/VHS videos and information on scratchbuilding these boats. One of the least known vessels in the world, they are not like tugboats, but are in the same class of Workboats. I design plans and do commissioned works on these boats in scales for R/C or display, having built many from small Utility, Tenders and Trip-boats, to their larger versions in Line & Long-haul classifications. Single, Twin, Triple and Quadruple screw Towboats are designs that I.....(Sink'um & Float'us Salvage Co).....have for the modeller.Plans and videos, all combined in a booklet (\$4.00 US). Another source with a different range is Joe E. Brown of Flatwoods, Kentucky (Western River Work Boats). If anyone is interested in building these boats, refer them to us as two of only three sources of plans..... We enjoy helping others to model these boats, having information that will help

them reach needed resources for research....for model building."

There you have it. Certainly would be something different! Contact addresses are S&FSC, 448 Tree Farm Road, New Florence, Mo. USA 63363 and for WRWB, 1010 Turkey Ave, Flatwoods, KY. USA 41139

Trade and commercial

Hare & Forbes open day, Sydney 14 - 17 May 1998

Hare & Forbes' four day Annual Sydney Sale and demonstration day is on again from Thursday 14 May until Sunday 17 May 1998

After the success of the previous years open day, the management and staff are once again extending an invitation to the trade and public to attend this year's event.

On display will be a huge range of workshop machinery and machine tools as well as demonstrations of the new range of HAFCO CNC lathes and milling machines. Other demonstrations include wood turning, grinding and tool sharpening, MIG welding, metal cutting and machining.

Technical representatives from a number of manufacturers will be on hand to answer questions, whether it be about wood working, metal working, or any other area in Hare & Forbes huge range. The local Rotary club will operate a barbeque to look after the many thousands of visitors which this event attracts.

Entry is free and customers can be assured of big discounts on a large range of items.

Goodbye, Tony

Tony di Salvo, an assistant editor with this magazine for some years, passed away recently. His valuable input will be missed.

... (Letterbox continued from page 48)

Sir,

Ted Murrell has done a very good job in developing the loose-headed steam valve shown in Issue 77. It is often very difficult getting all the threaded parts in a conventional valve concentric, and if they're not, the results are obvious and well known to us all. Full size steam valves have heads loosely mounted on the spindles for exactly the same reasons.

One point not related to the valve head design does need a small comment, though. As drawn, the valve can't be used on an AMBSC registered boiler because the spindle is not captive, and can be screwed right out of the valve while under steam.

Fortunately this is very easy to fix. If the parallel portion of the spindle and the gland are made a smaller diameter than the spindle thread, the spindle can be screwed into the body from the manifold side before the body is assembled on the seat, and before the handwheel disc is fitted. This limits the travel of the spindle, and brings the design into line with the boiler codes.

Ross Forsyth

Technical Representative, AMBSC

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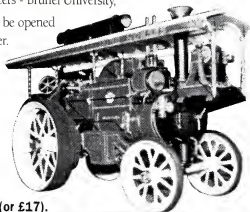
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Here Rudy looks at all aspects of grinding lathe tools to perfection. Really very good, and also includes plans for building a simple but effective, grinding table. In the main covers tools used in European type (IE horizontal) tool holders. Plans and printed reference notes included.

These tapes are good instructional aids - your tutor is there, on your TV, you can interrupt, go back over points and learn at your speed, as and when you like. Dave and Rudy are American, but in the few instances where techniques differ, they are covered in the tape. Neither are professional on screen performers, just ordinary model engineers, and their presentation is all the more acceptable for that. These videos really were shot in their workshops, which resulted in the occasional "wart" being visible, but this doesn't detract from the value of the information given. Don't buy these tapes if you are experienced and know all about the operations involved - they are good and comprehensive introductions for the less experienced.



Railroading in a Land of Giants Vol.3 (60 mins) £22.15

The latest from Steve Booth this video shows operations at the Golden Gate Live Steamers 7 1/2" track; Booth has been involved in the film industry for many years, and it shows - this is a well crafted video. Especially interesting for the scale rolling stock, this video has "The Longest Train" - 59 cars if we counted right, hauled by two engines! Also featured are some desels, as well as a "Daylight", 3 truck Shay, Santa Fe 4-8-4 and many more.

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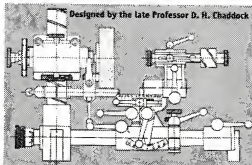
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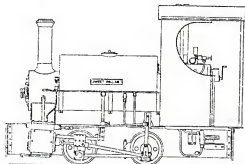
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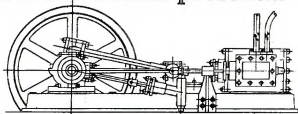
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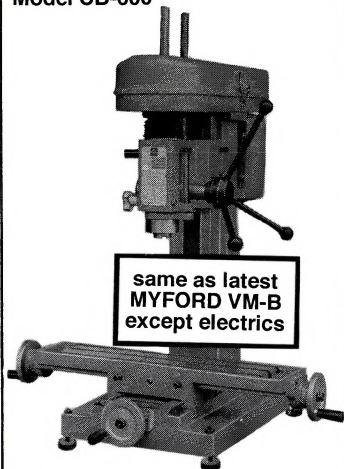
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AME Advertiser Index

AME - Books, Videos, Plans, etc.	6
Camden Books: Special list	54
Classic Marine: Seekadet, Opal & Topaz	10
Club event: ILS Hot Pot Run	9
Club event: SMEE (UK) 100th anniversary	53
E.&J. Winter - Locomotive: C32, 5" g kit	9
E.&J. Winter - Model Engineering Supplies	54
E.&J. Winter - Stationary Engine: No. 7 Kit	57
Emco Twin Vertical Stationary Engine	55
HAFCO Workshop Equipment	59
Hobby Mechanics - Locomotives	7
Hobby Mechanics - Quorn T&C Grinder	55
Hobby Mechanics - Universal Pillar Tool	9
Hobby Mechanics - Versatile Dividing Head	58
Live Steam Supplies - Index Head kit	57
LPR Tools, Videos, Books	56
Machining for Model Makers	57
Magazine: AMRM	55
Magazine: Australian Steam Power	56
Magazine: TOHM	55
Micro Position Sensor (MPS)	56
Microcraft Digital Position Readout	54
Minitech - Drill-Mill	58
Myford Lathe	8
Plough Books - General list	60
Plough Books - Special Feature	2
Precision Machining for all Models	7
Roberts - Locomotive: Sweet Pea - 5" g kit	55
Roberts - Model Engineering Supplies	2
Rolling Stock and Detail Components	8
Sheppard - Boiler Water Feed Pump	58
Stationary Engines and Boilers (full-size)	9
Stuart Model Stationary Engines	7
Taig Metal Cutting Lathe	9
The Diamond Tool Holder	8
Wato - Locomotive: Lil Mogul - 7.25" g	56
Williams Videos: Full range, Steam & Agr.	4

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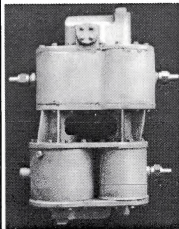
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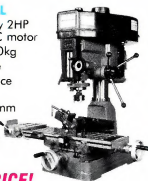
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